GMP/15-SEV-3
Volume 3 of 3

Spark Electric Vehicle

SERVICE MANUAL

INCLUDES: Power and Signal Distribution, Safety and Security, Seats, Steering, Suspension, Transmision

2015

2015 Chevrolet Spark EV Service Manual

Volume 3

This manual provides information on the diagnosis, the service procedures, the adjustments, and the specifications for the 2015 Chevrolet Spark EV.

The technicians who understand the material in this manual and in the appropriate Dealer Service Bulletins better serve the vehicle owners.

When this manual refers to a brand name, a part number, or a specific tool, you may use an equivalent product in place of the recommended item. All information, illustrations, and specifications in this manual are based on the latest product information available at the time of publication approval. General Motors LLC reserves the right to make changes at any time without notice.

Published by
North American Operations
General Motors LLC
Warren, Michigan 48090

© 2015 GENERAL MOTORS LLC
ALL RIGHTS RESERVED

The information cutoff date is 06/05/15.

LITHO IN U.S.A.

No part of this manual may be reproduced, stored in any retrieval system, or transmitted in any form or by any means including, but not limited to, electronic, mechanical, photocopying, and recording without the prior written permission of General Motors LLC. This applies to all text, illustrations, and tables.

Error and Suggestion Reporting

If you find an error in a GM Service manual, or if you have a suggestion about a GM service manual, we want to hear from you.

When calling, be prepared with the following information:

- Your name
- The name of your dealership
- The phone number of your dealership
- The model year and the vehicle line
- The publication part number, if present
- The vehicle identification number of the vehicle on which you are working
- The service category and page numbers
- Any applicable electronic information element identification numbers
- A descriptive explanation of your concern

The GM service manual phone personnel will respond to your concerns in the following ways:

- By delivering your concern to the author of the information
- By eliciting a response from the author
- By supplying you with an answer to your concerns

For paper manual users: The GM service manual phone personnel will also explain how to send in examples or marked-up pages.

For Electronic Manual users: Be prepared to provide any applicable identification numbers pertaining to the electronic information in question.

The GM service manual comment telephone numbers do not provide technical assistance. For technical assistance, contact your regular technical assistance source.

United States and Canada General Motors Dealer Employees

Please call the following number with your comments: 1-800-828-6860.

You may call Monday through Saturday, 8:00 a.m.– 8:00 p.m. Eastern Time. In order to send a fax, use the following number: 1-248-285-3045.

Canada, French Speaking General Motors Dealer Employees

Please call the following number with your comments: 1-800-503-3222.

You may call Monday through Saturday, 8:00 a.m.– 5:00 p.m. Eastern Time. In order to send a fax, use the following number: 1-248-285-3045.

International English Speaking General Motors Dealer Employees

Please call the following number with your comments: 1-248-285-2590.

You may call Monday through Saturday, 8:00 a.m.– 8:00 p.m. Eastern Time. In order to send a fax, use the following number: 1-248-285-3045.

United States and Canadian Vehicle Owner/Operator

Vehicle owners or operators are encouraged to address their comments and concerns to the applicable Customer Assistance Center. The phone number and address of the Customer Assistance Center are in the Owner's Manual.

DANGER

Danger: In order to reduce the chance of death, personal injury and/or property damage, carefully observe the instructions that follow:

The service manuals of General Motors are intended for use by professional, qualified technicians. Attempting repairs or service without the appropriate training, tools, and equipment could cause death or injury to you or others. This could also damage the vehicle, or cause the vehicle to operate improperly.

Proper vehicle service and repair are important to the safety of the service technician and to the safe, reliable operation of all motor vehicles. If you need to replace a part, use the same part number or an equivalent part. Do not use a replacement part of lesser quality.

The service procedures we recommend and describe in this service manual are effective methods of performing service and repair. Some of the procedures require the use of tools that are designed for specific purposes.

Accordingly, any person who intends to use a replacement part, a service procedure, or a tool that is not recommended by General Motors, must first establish that there is no jeopardy to personal safety or the safe operation of the vehicle.

This manual contains various "Dangers", "Warnings" and "Cautions" that you must observe carefully in order to reduce the risk of personal injury during service or repair. Improper service or repair may damage the vehicle or render the vehicle unsafe. These "Dangers", "Warnings" and "Cautions" are not exhaustive. General Motors can not possibly warn of all the potentially hazardous consequences of your failure to follow these instructions.

This manual covers service procedures to vehicles that are equipped with a Supplemental Inflatable Restraint. Refer to the "Warnings" in Dangers, Warnings and Cautions in Supplemental Inflatable Restraint. Refer to Supplemental Inflatable Restraint component and wiring location views in Supplemental Inflatable Restraint before performing a service on or around Supplemental Inflatable Restraint components or wiring. Failure to follow these "Dangers", "Warnings" and "Cautions" could cause air bag deployment, personal injury, or otherwise unnecessary Supplemental Inflatable Restraint repairs.

In order to help avoid accidental air bag deployment and personal injury, whenever you service a vehicle that requires repair of the Supplemental Inflatable Restraint and another vehicle system, we recommend that you first repair the Supplemental Inflatable Restraint, then go on to the other system.

Table of Contents

Volume 1

Preface 0-1
Dangers, Warnings, and Cautions 0-3

General Information 1-1
General Information 1-3
Air/Wind Noise 1-30
Maintenance and Lubrication 1-32
Squeaks and Rattles 1-34
Vibration Diagnosis and Correction 1-36
Waterleaks 1-83

Body Hardware and Trim 2-1
Exterior Trim 2-3
Floor Coverings and Headlinings 2-18
Instrument Panel and Console Trim 2-22
Interior Trim and Paneling 2-50

Body Repair 3-1
Bolted Exterior Body Panels and Closures 3-3
Bumpers and Fascias 3-47
Collision Repair 3-68
Frame and Underbody 3-118
Paint and Coatings 3-141
Plastic Panel Information and Repair 3-144

Body Systems 4-1
Fixed and Moveable Windows 4-5
Horns 4-55
Lighting 4-66
Mirrors 4-202
Vehicle Access 4-218
Wipers and Washers 4-286

Brakes 5-1
Antilock Brake System 5-5
Disc Brakes 5-96
Hydraulic Brakes 5-133
Park Brake 5-220

Diagnostic Overview, Starting Point, and Programming 6-1
Programming and Setup 6-3
Vehicle Diagnostic Information 6-20

Driveline/Axle 7-1
Wheel Drive Shafts 7-3

INDEX INDEX-1

Volume 2

Preface 0-1
Dangers, Warnings, and Cautions 0-3

Driver Information and Entertainment 8-1
Cellular, Entertainment, and Navigation 8-3
Displays and Gauges 8-76
Secondary and Configurable Customer Controls 8-102

Engine/Propulsion 9-1
12 V Starting and Charging 9-7
Cruise Control 9-38
Hybrid/EV Controls 9-53
Hybrid/EV Battery Heating and Cooling 9-198
Hybrid/EV Energy Storage 9-347
Plug-In Charging 9-552

HVAC 10-1
Heating, Ventilation, and Air Conditioning 10-3
HVAC - Automatic 10-80

INDEX INDEX-1

Volume 3

Preface 0-1
Dangers, Warnings, and Cautions 0-3

Power and Signal Distribution 11-1
Data Communications 11-5
Power Outlets 11-244
Wiring Systems and Power Management 11-251

Safety and Security 12-1
Immobilizer 12-3
Object Detection and Pedestrian Protection 12-35
Remote Functions 12-54
Seat Belts 12-81
Supplemental Inflatable Restraints 12-100
Theft Deterrent 12-185

Seats 13-1
Seat Hardware, Trim, and Upholstery 13-3
Seat Heating and Cooling 13-27

Steering 14-1
Power Steering 14-3
Steering Wheel and Column 14-24

Suspension 15-1
Front Suspension 15-3
Rear Suspension 15-19
Suspension General Diagnosis 15-28
Tire Pressure Monitoring 15-37
Tires and Wheels 15-48
Wheel Alignment 15-63

Transmission 16-1
Automatic Transmission - 1ET35 16-3
Shift Lock Control 16-98
Transmission Cooling 16-105

INDEX INDEX-1

Section 0

Dangers, Warnings, and Cautions

Dangers, Warnings, and Cautions 0-3
Definition of Danger, Warning, Caution, and Note 0-3
Approved Equipment for Collision Repair Warning 0-3
Assistant Driving Warning 0-3
Batteries Produce Explosive Gases Warning 0-3
Battery Disconnect Warning 0-4
Brake Dust Warning 0-4
Brake Fluid Irritant Warning 0-4
Brake Fluid Warning 0-4
Checking Hot Transmission Fluid through Drain Plug Hole Warning 0-4
Collision Sectioning Warning 0-4
Cracked Window Warning 0-4
Defroster Outlet Warning 0-4
Electric Coolant Fan Warning 0-4
Exhaust Service Warning 0-4
Eye Protection Warning 0-4
Glass and Sheet Metal Handling Warning 0-5
Halogen Bulb Warning 0-5
Hood Hold-Open Device Warning 0-5
Moving Parts and Hot Surfaces Warning 0-5
Parking Brake and Drive Wheels Warning 0-5
Protective Goggles and Glove Warning 0-5
R-1234yf Proper Service Procedures Warning ... 0-5
Radiator Cap Removal Warning 0-5
Relieving Fuel Pressure Warning 0-5
Repair Material Curing Warning 0-5
Road Test Warning 0-5
Safety Glasses and Compressed Air Warning ... 0-5
Safety Glasses Warning 0-5
Sensing and Diagnostic Module Handling Warning 0-6
Sensing and Diagnostic Module Voltage after Ignition is Turned Off Warning 0-6
Servicing the SIR System Warning 0-6
SIR Deployed Inflator Modules Are Hot Warning 0-6
SIR Inflatable Module Deployment Outside Vehicle Warning 0-6
SIR Inflator Module Disposal Warning 0-6
SIR Inflator Module Handling and Storage Warning 0-6
SIR Seatbelt Pretensioner Handling Warning 0-6
SIR Warning 0-7
Torque-to-Yield Fastener Warning 0-7
Work Stall Test Warning 0-7
Air Conditioning Compressor Support Caution ... 0-7
Air in the Power Steering System Caution 0-7
Avoid Damage to Grid Lines Caution 0-7
Belt Dressing Caution 0-7
Brake Caliper Caution 0-7
Brake Fluid Damage to Electrical Connections Caution 0-7
Brake Fluid Effects on Paint and Electrical Components Caution 0-7
Catalytic Converter Movement Caution 0-8
Clearcoat/Ultraviolet Screeners Caution 0-8
Clutch Actuator Cylinder Mounting Sleeve Caution 0-8
Clutch Hydraulic System Lubricant Caution 0-8
Component Fastener Tightening Caution 0-8
Compressed Air Should Not Exceed 98 kPa (14 psi) Caution 0-8
Drive Axle Caution 0-8
Engine Coolant Thermostat Housing Caution 0-8
Engine Lifting Caution 0-8
Engine Mounting Caution 0-8
Exterior Trim Emblem Removal Caution 0-8
Fastener Caution 0-8
Filling the Master Cylinder Caution 0-8
Flex Decoupler Caution 0-8
HVAC Module Drain Tube Caution 0-9
Ignition OFF When Disconnecting Battery Caution 0-9
Installing Hoses without Twists or Bends Caution 0-9
Liftgate Assist Rod Caution 0-9
Power Steering Hose Disconnected Caution 0-9
Refrigerant Pressure During Testing Caution 0-9
Steering Column in Lock Position Caution 0-9
Steering Wheel in the Full Turn Position Caution 0-9
Steering Wheel Straight and Column Locked Caution 0-9
Test Probe Caution 0-9

Three-Way Catalytic Converter Damage Caution 0-10
Torque-to-Yield Fastener Caution 0-10
Using Proper Power Steering Fluid Caution 0-10
Vehicle Lifting and Jacking Caution 0-10
Windshield Installation Caution 0-10

Dangers, Warnings, and Cautions

Definition of Danger, Warning, Caution, and Note

The diagnosis and repair procedures in a GM Service Manual contain both general and specific Dangers, Warnings, Cautions, Notes or Importants. GM is dedicated to the presentation of service information that helps the technician to diagnose and repair the systems necessary for the proper operation of the vehicle, however, certain procedures may present a hazard to the technician if they are not followed in the recommended manner . Dangers, Warnings, Cautions and Notes or Importants are elements designed to prevent these hazards, however, not all hazards can be foreseen. This information is placed at strategic locations within the service manual. This information is designed to prevent the following from occurring:

- Serious bodily injury or death to the technician
- Damage to the vehicle
- Unnecessary vehicle repairs
- Unnecessary component replacement
- Improper repair or replacement of vehicle components.
- Any warning or caution that appears in this service category is referenced from the individual service categories.

DANGER Defined

When encountering a DANGER, you will be asked to take a necessary action or not to take a prohibited action. If a DANGER is not heeded, the following consequences may occur:

- Serious bodily injury or death to the technician
- Serious bodily injury or death to other technicians in the workplace area

WARNING Defined

When encountering a WARNING, you will be asked to take a necessary action or not to take a prohibited action. If a WARNING is not heeded, the following consequences may occur:

- Serious bodily injury to the technician
- Serious bodily injury to other technicians in the workplace area
- Serious bodily injury to the driver and/or passenger(s) of the vehicle, if the vehicle has been improperly repaired

CAUTION Defined

CAUTIONS call special attention to a necessary action or to a prohibited action. If a CAUTION is not heeded, the following consequences may occur:

- Damage to the vehicle
- Unnecessary vehicle repairs
- Unnecessary component replacement
- Improper operation or performance of the system or component under repair
- Damage to any systems or components which are dependent upon the proper operation of the system or component under repair
- Improper operation or performance of any systems or components which are dependent upon the proper operation or performance of the system or component under repair
- Damage to fasteners, basic tools, or special tools
- The leakage of coolant, lubricant, or other vital fluids

NOTE or IMPORTANT Defined

NOTE and IMPORTANT statements emphasize a necessary characteristic of a diagnostic or repair procedure. NOTE or IMPORTANT statements are designed to do the following:

- Clarify a procedure
- Present additional information for accomplishing a procedure
- Give insight into the reason or reasons for performing a procedure in the manner recommended
- Present information that will help to accomplish a procedure in a more effective manner
- Present information that gives the technician the benefit of past experience in accomplishing a procedure with greater ease

Approved Equipment for Collision Repair Warning

Warning: To avoid personal injury when exposed to welding flashes or to galvanized (Zinc Oxide) metal toxic fumes while grinding/cutting on any type of metal or sheet molded compound, you must work in a properly ventilated area, wearing an approved respirator, eye protection , earplugs, welding gloves, and protective clothing.

Assistant Driving Warning

Warning: An assistant should drive the vehicle while the technician checks for the location of the reported condition. Otherwise, personal injury could result.

Batteries Produce Explosive Gases Warning

Warning: Batteries produce explosive gases. Batteries contain corrosive acid. Batteries supply levels of electrical current high enough to cause burns. Therefore, in order to reduce the risk of personal injury while working near a battery, observe the following guidelines:

- ***Always shield your eyes.***
- ***Avoid leaning over the battery whenever possible.***
- ***Do not expose the battery to open flames or sparks.***

- *Do not allow battery acid to contact the eyes or the skin.*
  - *Flush any contacted areas with water immediately and thoroughly.*
  - *Get medical help.*

Battery Disconnect Warning

***Warning:** Unless directed otherwise, the ignition must be OFF with the key removed, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.*

For Vehicles equipped with OnStar® (UE1) with Back Up Battery:

The Back Up Battery is a redundant power supply to allow limited OnStar® functionality in the event of a main vehicle battery power disruption to the VCIM (OnStar® module). Do not disconnect the main vehicle battery or remove the OnStar® fuse with the ignition key in any position other than OFF. Retained accessory power should be allowed to time out or be disabled (simply opening the driver door should disable retained accessory power) before disconnecting power. Disconnecting power to the OnStar® module in any way while the ignition is On or with retained accessory power activated may cause activation of the OnStar® Back-Up Battery system and will discharge and permanently damage the back-up battery. Once the Back-Up Battery is activated it will stay on until it has completely discharged. The back-up battery is not rechargeable and once activated the back-up battery must be replaced.

Brake Dust Warning

***Warning:** Avoid taking the following actions when you service wheel brake parts:*

- *Do not grind brake linings.*
- *Do not sand brake linings.*
- *Do not clean wheel brake parts with a dry brush or with compressed air.*

Some models or aftermarket brake parts may contain asbestos fibers which can become airborne in dust. Breathing dust with asbestos fibers may cause serious bodily harm. Use a water-dampened cloth in order to remove any dust on brake parts. Equipment is available commercially in order to perform this washing function. These wet methods prevent fibers from becoming airborne.

Brake Fluid Irritant Warning

***Warning:** Brake fluid may irritate eyes and skin. In case of contact, take the following actions:*

- *Eye contact—rinse thoroughly with water.*
- *Skin contact—wash with soap and water.*
- *If ingested—consult a physician immediately.*

Brake Fluid Warning

***Warning:** Use only Delco Supreme 11, GM P/N 12377967 (Canadian P/N 992667), or equivalent DOT 3 brake fluid from a clean, sealed container. Do not use fluid from an open container that may be contaminated with water. Improper or contaminated fluid could result in damage to components, or loss of braking, with possible injury.*

Checking Hot Transmission Fluid through Drain Plug Hole Warning

***Warning:** The engine must be running when the transmission fluid fill plug is removed, or excessive fluid loss will occur. Transmission fluid may be hot. Since the actual fluid level is unknown, stand clear when removing the fill plug. Have a container ready to capture any lost fluid. Do not turn the engine off with the fill plug removed, as you can be injured by hot transmission fluid being expelled out of the oil fill opening.*

Collision Sectioning Warning

***Warning:** Sectioning should be performed only in the recommended areas. Failure to do so may compromise the structural integrity of the vehicle and cause personal injury if the vehicle is in a collision.*

Cracked Window Warning

***Warning:** If a window is cracked but still intact, crisscross the window with masking tape in order to reduce the risk of damage or personal injury.*

Defroster Outlet Warning

***Warning:** If broken glass falls into the defroster outlets, it can be blown into the passenger compartment and cause personal injury.*

Electric Coolant Fan Warning

***Warning:** An electric fan under the hood can start up even when the engine is not running and can injure you. Keep hands, clothing and tools away from any underhood electric fan.*

Exhaust Service Warning

***Warning:** In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.*

Eye Protection Warning

***Warning:** Approved safety glasses and gloves should be worn when performing this procedure to reduce the chance of personal injury.*

Glass and Sheet Metal Handling Warning

Warning: When working with any type of glass or sheet metal with exposed or rough edges, wear approved safety glasses and gloves in order to reduce the chance of personal injury.

Halogen Bulb Warning

Warning: Halogen bulbs contain gas under pressure. Handling a bulb improperly could cause it to shatter into flying glass fragments. To help avoid personal injury:

- ***Turn off the lamp switch and allow the bulb to cool before changing the bulb.***
- ***Leave the lamp switch OFF until the bulb change is complete.***
- ***Always wear eye protection when changing a halogen bulb.***
- ***Handle the bulb only by its base. Avoid touching the glass.***
- ***Keep dirt and moisture off the bulb.***
- ***Properly dispose of the used bulb.***
- ***Keep halogen bulbs out of the reach of children.***

Hood Hold-Open Device Warning

Warning: When a hood hold open device is being removed or installed, provide alternate support to avoid the possibility of damage to the vehicle or personal injury.

Moving Parts and Hot Surfaces Warning

Warning: Avoid contact with moving parts and hot surfaces while working around a running engine in order to prevent physical injury.

Parking Brake and Drive Wheels Warning

Warning: Apply the parking brake and block the drive wheels before performing this procedure in order to prevent bodily injury.

Protective Goggles and Glove Warning

Warning: Always wear protective goggles and gloves when removing exhaust parts as falling rust and sharp edges from worn exhaust components could result in serious personal injury.

R-1234yf Proper Service Procedures Warning

Warning: For personal safety, proper service procedure and refrigerant handling guidelines reference the applicable SAE standards when servicing vehicles equipped with R-1234yf refrigerant systems. Reference SAE J639, SAE J2845, SAE J2842, SAE J2843 & SAE J2851. Failure to follow these precautions may cause personal injury and/or damage to the vehicle or its components.

Radiator Cap Removal Warning

Warning: To avoid being burned, do not remove the radiator cap or surge tank cap while the engine is hot. The cooling system will release scalding fluid and steam under pressure if radiator cap or surge tank cap is removed while the engine and radiator are still hot.

Relieving Fuel Pressure Warning

Warning: Remove the fuel tank cap and relieve the fuel system pressure before servicing the fuel system in order to reduce the risk of personal injury. After you relieve the fuel system pressure, a small amount of fuel may be released when servicing the fuel lines, the fuel injection pump, or the connections. In order to reduce the risk of personal injury, cover the fuel system components with a shop towel before disconnection. This will catch any fuel that may leak out. Place the towel in an approved container when the disconnection is complete.

Repair Material Curing Warning

Warning: At least 24 hours are required for complete curing of repair material. The repair area should not be physically disturbed until after that time. Insufficient curing of urethane adhesive may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

Road Test Warning

Warning: Road test a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control. Failure to adhere to these precautions could lead to serious personal injury and vehicle damage.

Safety Glasses and Compressed Air Warning

Warning: Wear safety glasses when using compressed air in order to prevent eye injury.

Safety Glasses Warning

Warning: Wear safety glasses in order to avoid eye damage.

Sensing and Diagnostic Module Handling Warning

Warning: Be careful when you handle a sensing and diagnostic module (SDM). Do not strike or jolt the SDM. Before applying power to the SDM:

- ***Remove any dirt, grease, etc. from the mounting surface***
- ***Position the SDM horizontally on the mounting surface***
- ***Point the arrow on the SDM toward the front of the vehicle***
- ***Tighten all of the SDM fasteners and SDM bracket fasteners to the specified torque value***

Failure to follow the correct procedure could cause air bag deployment, personal injury, or unnecessary SIR system repairs.

Sensing and Diagnostic Module Voltage after Ignition is Turned Off Warning

Warning: The sensing and the diagnosis module (SDM) can maintain sufficient voltage to deploy the airbags and pretensioners for up to 1 minute after the ignition has been turned OFF and the fuse has been removed. If the airbags and pretensioners are not disconnected, do not begin service until one minute has been passed after disconnecting power to the SDM. Failure to do so may cause personal injury.

Servicing the SIR System Warning

Warning: When performing service on or around the SIR components or the SIR wiring, follow the procedures listed below in order to temporarily disable the SIR system. Failure to follow the procedures could result in the following:

- ***Air bag deployment***
- ***Personal injury***
- ***Otherwise unneeded SIR system repairs***

SIR Deployed Inflator Modules Are Hot Warning

Warning: After deployment, the metal surfaces of the SIR component may be very hot. To help avoid a fire or personal injury:

- ***Allow sufficient time for cooling before touching any metal surface of the SIR component.***
- ***Do not place the deployed SIR component near any flammable objects.***

SIR Inflatable Module Deployment Outside Vehicle Warning

Warning: When you are deploying an inflator module for disposal, perform the deployment procedures in the order listed. Failure to follow the procedures in the order listed may result in personal injury.

SIR Inflator Module Disposal Warning

Warning: In order to prevent accidental deployment and the risk of personal injury, do not dispose of an undeployed inflator module as normal shop waste. Undeployed inflator modules contain substances that could cause severe illness or personal injury if their sealed containers are damaged during disposal. Use the following deployment procedures to safely dispose of an undeployed inflator module. Failure to observe the following disposal methods may be a violation of federal, state, or local laws.

SIR Inflator Module Handling and Storage Warning

Warning: When carrying an undeployed inflator module:

- ***Do not carry the inflator module by the wires or connector.***
- ***Make sure the air bag opening points away from you.***

When storing an undeployed inflator module:

- ***Make sure the air bag opening points away from the surface on which the inflator module rests.***
- ***Provide free space for the air bag to expand in case of an accidental deployment.***
- ***When storing a steering column, do not rest the column with the air bag opening facing down and the column vertical. Lay the column on its side.***

Failure to observe these guidelines may result in personal injury.

SIR Seatbelt Pretensioner Handling Warning

Warning: When carrying an undeployed inflatable restraint seat belt retractor pretensioner:

- ***Do not carry the seat belt pretensioner by the seat belt webbing or pigtail connector, if equipped.***
- ***Carry the seat belt pretensioner by the housing, keeping hands and fingers away from the seat belt webbing.***
- ***Make sure the opening, from which the seat belt webbing extends, faces downward and the seat belt webbing hangs freely.***

Failure to observe these guidelines may result in personal injury.

SIR Warning

Warning: This vehicle is equipped with a Supplemental Inflatable Restraint (SIR) System. Failure to follow the correct procedure could cause the following conditions:

- ***Air bag deployment***
- ***Personal injury***
- ***Unnecessary SIR system repairs***

In order to avoid the above conditions, observe the following guidelines:

- ***Refer to Master Electrical Components List in order to determine if you are performing service on or near the SIR components or the SIR wiring.***
- ***If you are performing service on or near the SIR components or the SIR wiring, disable the SIR system. Refer to Disabling the SIR System.***

Torque-to-Yield Fastener Warning

Warning: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fasteners could cause damage to the vehicle, component, or bodily injury.

Work Stall Test Warning

Warning: One or more of the following guidelines may apply when performing specific required tests in the work stall:

- ***When a test requires spinning the drive wheels with the vehicle jacked up, adhere to the following precautions:***
  - ***Do not exceed 56 km/h (35 mph) when spinning one drive wheel with the other drive wheel stopped. This limit is necessary because the speedometer indicates only one-half the actual vehicle speed under these conditions. Personal injury may result from excessive wheel spinning.***
  - ***If all of the drive wheels are spinning at the same speed, do not exceed 112 km/h (70 mph). Personal injury may result from excessive wheel spinning.***
  - ***All persons should stay clear of the rotating components and the balance weight areas in order to avoid possible personal injury.***
  - ***When running an engine in the repair stall for an extended period of time, use care not to overheat the engine and the transmission.***
- ***When a test requires jacking up the vehicle and running with the wheels and brake rotors removed, adhere to the following precautions:***
  - ***Support the suspension at normal ride height.***
  - ***Do not apply the brake with the brake rotors removed.***
  - ***Do not place the transmission in PARK with the drive axles spinning.***
  - ***Turn Off the ignition in order to stop the powertrain components from spinning.***
- ***When running an engine in the work stall, use the exhaust removal system to prevent breathing dangerous gases.***

Air Conditioning Compressor Support Caution

Caution: Ensure the air conditioning compressor is supported by a table or work area sturdy enough to handle the weight. Do not use the hoses to support the compressor. Using the compressor hoses to bear the weight of the compressor may damage the air conditioning compressor/hoses and in turn may cause a refrigerant leak. The hoses are not designed to support the weight of the air conditioning compressor.

Air in the Power Steering System Caution

Caution: If the power steering system has been serviced, an accurate fluid level reading cannot be obtained unless air is bled from the steering system. The air in the fluid may cause pump cavitation noise and may cause pump damage over a period of time.

Avoid Damage to Grid Lines Caution

Caution: If you use a razor blade or other sharp tool in order to remove the adhesives or foreign objects from the inside of the rear window, use the blade carefully. Damage to the grid lines may result.

Belt Dressing Caution

Caution: Do not use belt dressing on the drive belt. Belt dressing causes the breakdown of the composition of the drive belt. Failure to follow this recommendation will damage the drive belt.

Brake Caliper Caution

Caution: Support the caliper with a piece of wire to prevent damage to the brake line.

Brake Fluid Damage to Electrical Connections Caution

Caution: Brake fluid will damage electrical connections and painted surfaces. Use shop cloths, suitable containers, and fender covers to prevent brake fluid from contacting these areas. Always re-seal and wipe off brake fluid containers to prevent spills.

Brake Fluid Effects on Paint and Electrical Components Caution

Caution: Avoid spilling brake fluid onto painted surfaces, electrical connections, wiring, or cables. Brake fluid will damage painted surfaces and cause corrosion to electrical components. If any brake fluid comes in contact with painted surfaces, immediately

flush the area with water. If any brake fluid comes in contact with electrical connections, wiring, or cables, use a clean shop cloth to wipe away the fluid.

Catalytic Converter Movement Caution

Caution: To prevent internal damage to the flexible coupling of the catalytic converter assembly, the converter must be supported. The vertical movement at the rear of the catalytic converter assembly must not exceed 6 degrees up or down.

Clearcoat/Ultraviolet Screeners Caution

Caution: Removing more than 0.5 mils of the clearcoat can result in early paint failure. The clearcoat contains ultraviolet screeners. Do not finesse sand more than what is required to remove the defect.

Clutch Actuator Cylinder Mounting Sleeve Caution

Caution: Use a mounting sleeve when installing the clutch actuator cylinder to the transmission. The transmission input shaft has sharp edges and can damage the clutch actuator cylinder. Failure to follow this caution may cause a leak and damage to the clutch actuator cylinder.

Clutch Hydraulic System Lubricant Caution

Caution: Do not use mineral or paraffin-base oil in the clutch hydraulic system. These fluids may damage the rubber parts in the cylinders.

Component Fastener Tightening Caution

Caution: Replacement components must be the correct part number for the application. Components requiring the use of the thread locking compound, lubricants, corrosion inhibitors, or sealants are identified in the service procedure. Some replacement components may come with these coatings already applied. Do not use these coatings on components unless specified. These coatings can affect the final torque, which may affect the operation of the component. Use the correct torque specification when installing components in order to avoid damage.

Compressed Air Should Not Exceed 98 kPa (14 psi) Caution

Caution: When using compressed air to remove components, air pressure should not exceed 98 kPa (14 psi).

Drive Axle Caution

Caution: Support the lower control arms in the normal horizontal position in order to avoid damage to the drive axles. Do not operate the vehicle in gear with the wheels hanging down at full travel.

Engine Coolant Thermostat Housing Caution

Caution: Use care when performing this procedure. Use of excessive force may damage the coolant thermostat.

Engine Lifting Caution

Caution: When raising or supporting the engine for any reason, do not use a jack under the oil pan, any sheet metal, or the crankshaft pulley. Lifting the engine in an unapproved manner may cause component damage.

Engine Mounting Caution

Caution: Broken engine mountings can cause misalignment of certain drive-train components. Misalignment of drive-train components causes eventual destruction of the drive-train components.

If one engine mount breaks, the rest of the engine mounts will have increased stress put on them. This could cause the rest of the engine mounts to break.

Exterior Trim Emblem Removal Caution

Caution: Use a plastic, flat-bladed tool to prevent paint damage when removing an emblem/name plate.

Fastener Caution

Caution: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Do not use paints, lubricants, or corrosion inhibitors on fasteners, or fastener joint surfaces, unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems. When using fasteners that are threaded directly into plastic, use extreme care not to strip the mating plastic part(s). Use hand tools only, and do not use any kind of impact or power tools. Fastener should be hand tightened, fully seated, and not stripped.

Filling the Master Cylinder Caution

Caution: When filling the master cylinder, use only Delco Supreme 11, GM P/N 12377967 (Canadian P/N 992667), or equivalent DOT 3 brake fluid. Do not use a container which has been used for petroleum based fluids, or a container which is wet with water. Petroleum based fluids will cause swelling and distortion of rubber parts in the hydraulic brake system, and water will mix with brake fluid, lowering the boiling point. Keep all fluid containers capped to prevent contamination.

Flex Decoupler Caution

Caution: Do not over-flex or damage the flex joint when moving the flex joint from the normal mounting position.

HVAC Module Drain Tube Caution

Caution: Always ensure the HVAC module drain tube is properly installed and secure following a repair. Residual moisture/water can collect inside the HVAC module. The residual moisture or water should not contact electrical modules, electrical connections, wiring, cables or carpeting. Use clean and absorbent shop clothes to protect these components while removing or installing the HVAC module drain tube and/or HVAC module. Moisture/water is a by-product of normal A/C system operation and can result in interior odors or corrosion/damage to electrical components.

Ignition OFF When Disconnecting Battery Caution

Caution: Always turn the ignition OFF when connecting or disconnecting battery cables, battery chargers, or jumper cables. Failing to do so may damage the Powertrain Control Module (PCM) or other electronic components.

Installing Hoses without Twists or Bends Caution

Caution: The inlet and outlet hoses must not be twisted during installation. Do not bend or distort the inlet or outlet hoses to make installation easier. Failure to follow these procedures could result in component damage.

Liftgate Assist Rod Caution

Caution: Apply pressure only at the end of the liftgate/hood assist rod that you are removing or attaching. Do NOT apply pressure to the middle of the rod because damage or bending will result.

Power Steering Hose Disconnected Caution

Caution: Do not start the vehicle with any power steering gear inlet or outlet hoses disconnected. When disconnected, plug or cap all openings of components. Failure to do so could result in contamination or loss of power steering fluid and damage to the system.

Refrigerant Pressure During Testing Caution

Caution: Leak detection shall only be done with the refrigerant that is specified for the system. Do not attempt to increase pressure of the A/C refrigerant system with shop air or another type of refrigerant. Failure to follow the above guidelines could result in damage to the vehicle or its components.

Steering Column in Lock Position Caution

Caution: With wheels of the vehicle facing straight ahead, secure the steering wheel utilizing steering column anti-rotation pin, steering column lock, or a strap to prevent rotation. Locking of the steering column will prevent damage and a possible malfunction of the SIR system. The steering wheel must be secured in position before disconnecting the following components:

- The steering column
- The steering shaft coupling
- The intermediate shaft(s)

After disconnecting these components, do not rotate the steering wheel or move the front tires and wheels. Failure to follow this procedure may cause the SIR coil assembly to become un-centered and cause possible damage to the SIR coil. If you think the SIR coil has became un-centered, refer to your specific SIR coil's centering procedure to re-center SIR Coil.

Steering Wheel in the Full Turn Position Caution

Caution: Do not hold the steering wheel in the full turn position longer than 5 seconds, as damage to the steering pump may result.

Steering Wheel Straight and Column Locked Caution

Caution: With wheels of the vehicle facing straight ahead, secure the steering wheel utilizing steering column anti-rotation pin, steering column lock, or a strap to prevent rotation. Locking of the steering column will prevent damage and a possible malfunction of the SIR system. The steering wheel must be secured in position before disconnecting the following components:

- The steering column
- The intermediate shaft(s)
- The steering gear

After disconnecting these components, do not rotate the steering wheel or move the front tires and wheels. Failure to follow this procedure may cause the SIR coil assembly to become un-centered and cause possible damage to the SIR coil. If you think the SIR coil has became un-centered, refer to your specific SIR coil's centering procedure to re-center SIR Coil.

Test Probe Caution

Caution: Do not insert test equipment probes (DMM etc.) into any connector or fuse block terminal. The diameter of the test probes will deform most terminals. A deformed terminal will cause a poor connection, which will result in a system failure. Always use the J-35616-F GM Approved Terminal Release Tool Kit in order to front probe terminals. Do not use paper clips or other substitutes to probe terminals.

When using the J-35616-F GM Approved Terminal Release Tool Kit , ensure the terminal test adapter choice is the correct size for the connector terminal. Do not visually choose the terminal test adapter because some connector terminal cavities may appear larger than the actual terminal in the cavity. Using a larger terminal test adapter will damage the terminal. Refer to the J-35616-F GM Approved Terminal Release Tool Kit label on the inside of the J-35616-F GM Approved Terminal Release Tool Kit for the correct adapter along with the connector end view for terminal size.

Three-Way Catalytic Converter Damage Caution

Caution: In order to avoid damaging the replacement three-way catalytic converter, correct the engine misfire or mechanical fault before replacing the three-way catalytic converter.

Torque-to-Yield Fastener Caution

Caution: This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.

Using Proper Power Steering Fluid Caution

Caution: When adding fluid or making a complete fluid change, always use the proper power steering fluid. Failure to use the proper fluid will cause hose and seal damage and fluid leaks.

Vehicle Lifting and Jacking Caution

Caution: Perform the following steps before beginning any vehicle lifting or jacking procedure:

- Remove or secure all of the vehicle contents in order to avoid any shifting or any movement that may occur during the vehicle lifting or jacking procedure.
- The lifting equipment or the jacking equipment weight rating must meet or exceed the weight of the vehicle and any vehicle contents.
- The lifting equipment or the jacking equipment must meet the operational standards of the lifting equipment or jacking equipment manufacturer.
- Perform the vehicle lifting or jacking procedure on a clean, hard, dry, level surface.
- Perform the vehicle lifting or jacking procedure only at the identified lift points. DO NOT allow the lifting equipment or jacking equipment to contact any other vehicle components.

Failure to perform the previous steps could result in damage to the lifting equipment or the jacking equipment, the vehicle, and/or the vehicle contents.

Windshield Installation Caution

Caution: Do not use spacers when installing a windshield. The stress caused by the spacers may damage the windshield.

Section 11

Power and Signal Distribution

Data Communications 11-5
Schematic and Routing Diagrams 11-5
Data Communication Schematics 11-6
Body Control System Schematics 11-14
Diagnostic Information and Procedures 11-18
Control Module U Code List 11-18
DTC B1000 11-27
DTC B1001 11-28
DTC B101D 11-29
DTC B101E 11-30
DTC C056D 11-31
DTC C056E 11-32
DTC P0601-P0606, P060A, P062F, or P262B 11-33
DTC P06E4 11-35
DTC P0A1F, P1A01, P1A05, or P1A06 11-38
DTC P16B7 11-39
DTC P16B8-P16BA 11-41
DTC P16C1-P16C5 11-42
DTC P16C6 11-43
DTC P1E8E-P1E91 or P1F06 11-45
DTC P1E94-P1E97 or P1F07 11-46
DTC P1E9A-P1E9D or P1F08 11-47
DTC P1EA0-P1EA3 or P1F09 11-48
DTC P1EB1 11-49
DTC P1EB2-P1EB5, P1FA6-P1FAB, P3030, or P303B 11-50
DTC P1EB9 11-52
DTC P1EC1 or P1EC2 11-55
DTC P1EF8 11-57
DTC P1FAC, P1FB1, P1FB7, P1FBD, or P1FCF 11-59
DTC P1FAD, P1FB3, P1FB9, P1FBF, or P1FD1 11-60
DTC P1FAE, P1FB4, P1FBA, P1FC0, or P1FD2 11-61
DTC P1FAF, P1FB5, P1FBB, P1FC1, or P1FD3 11-62
DTC P1FB0, P1FB6, P1FBC, P1FC2, or P1FD4 11-63
DTC P1FB2, P1FB8, P1FBE, P1FD0, or P1FF3 11-64
DTC P3031-P3034 or P3037 11-65
DTC P303C-P303F or P3042 11-66
DTC U0020 11-67
DTC U0073 or U2100 11-68
DTC U0074 11-69
DTC U0077 11-74
DTC U007A 11-75
DTC U0078 11-80
DTC U0100-U02FF 11-81
DTC U0300-U0336 11-86
DTC U0400-U05FF 11-87
DTC U1500-U15FF 11-88
DTC U179A 11-91
DTC U1803 11-94
DTC U1806 11-97
DTC U1807 11-98
DTC U180A 11-99
DTC U180B 11-100
DTC U180C 11-101
DTC U180D 11-102
DTC U1814 11-103
DTC U1817 11-105
DTC U1818 11-108
DTC U182D 11-111
DTC U182E 11-114
DTC U1833 11-117
DTC U1838 11-120
DTC U1839 11-123
DTC U183C 11-126
DTC U183E 11-129
DTC U1845 or U1846 11-132
DTC U184A 11-134
DTC U184B 11-137
DTC U184C 11-140
DTC U184D 11-143
DTC U184E 11-146
DTC U1858 11-149
DTC U185A 11-152
DTC U185B 11-157
DTC U185C 11-161
DTC U1860 11-164
DTC U1861 11-167
DTC U186A 11-170
DTC U186B 11-173
DTC U1876 11-176
DTC U1885 11-179
DTC U18A4 11-183
DTC U18B9-U18BF 11-186
DTC U2099 11-187
DTC U2401 11-189

DTC U2602 11-192
DTC U2603-U2606 or U2617-U2622 11-196
DTC U2608 11-198
DTC U2609 11-201
DTC U2611 11-204
DTC U2612 11-206
DTC U2613 11-209
DTC U2615 11-212
DTC U2623 or U2624 11-215
Symptoms - Data Communications 11-218
Scan Tool Does Not Power Up 11-218
Scan Tool Does Not Communicate with Chassis High Speed GMLAN Device 11-219
Scan Tool Does Not Communicate with High Speed GMLAN Device 11-224
Scan Tool Does Not Communicate with Low Speed GMLAN Device 11-229
Data Link References 11-232
Repair Instructions 11-234
Body Control Module Replacement 11-234
Body Control Module Bracket Replacement 11-235
Hybrid Powertrain Control Module 2 Replacement 11-236
Description and Operation 11-237
Body Control System Description and Operation 11-237
Data Link Communications Description and Operation 11-237

Power Outlets 11-244
Schematic and Routing Diagrams 11-244
Cigar Lighter/Power Outlet Schematics 11-245
Diagnostic Information and Procedures 11-246
Symptoms - Power Outlets 11-246
Power Outlet Receptacle Malfunction 11-246
Repair Instructions 11-248
Accessory Power Receptacle Retainer Replacement 11-248
Accessory Power Receptacle Replacement 11-249
Description and Operation 11-250
Power Outlets Description and Operation 11-250
Special Tools and Equipment 11-250

Wiring Systems and Power Management 11-251
Specifications 11-251
Fastener Tightening Specifications 11-251
Schematic and Routing Diagrams 11-252
Harness Routing Views 11-252
How to Use Electrical Schematics 11-272
Electrical Schematic Symbols 11-298
Vehicle Zoning Strategy 11-312
Schematics RPO Code List 11-313
Master Electrical Schematic Icons 11-313
Power Distribution Schematics 11-314
Power Moding Schematics 11-327
Ground Distribution Schematics 11-333
Component Locator 11-343
Master Electrical Component List 11-343
Front of Vehicle/Engine Compartment Component Views 11-374
Powertrain Component Views 11-380
Instrument Panel/Center Console Component Views 11-382
Passenger Compartment/Roof Component Views 11-388
Door Component Views 11-395
Luggage Compartment/Rear of Vehicle Component Views 11-401
Wheels/Vehicle Underbody Component Views 11-406
Ground Views 11-411
Electrical Center Identification Views 11-430
Component Connector End Views 11-455
Inline Harness Connector End Views 11-761
Diagnostic Information and Procedures 11-818
DTC B097B 11-818
DTC B1370 (Instrument Cluster) 11-821
DTC B1370-B1379, B1380-B1389, or B1440-B1443 11-823
DTC B1445 11-827
DTC B144A 11-829
DTC B144B 11-831
DTC B1451 11-834
DTC B147E or B147F 11-836
DTC C0847, C0848, C1240, or C1241 11-840
DTC C0857 or C1242 11-842
DTC P15B9 or P15BA 11-844
DTC P1A5E or P1A5F 11-846
DTC P1A60 11-848
DTC P1EF6 or P1EF7 11-850
DTC P2534 or P2535 11-852
DTC P2537 (Hybrid/EV Powertrain Control Module 2) 11-854
Ignition Can/Cannot Be Turned Off with Transmission in Any Gear 11-856
Power Mode Mismatch 11-857
Retained Accessory Power Malfunction 11-863
Vehicle ON/OFF Switch Indicator Malfunction 11-865
Vehicle Will Not Change Power Mode 11-867
General Electrical Diagnosis 11-871
Checking Aftermarket Accessories 11-871
Circuit Testing 11-871
Using Connector Test Adapters 11-872
Probing Electrical Connectors 11-872
Troubleshooting with a Digital Multimeter 11-873
Troubleshooting with a Test Lamp 11-874
Using Fused Jumper Wires 11-874
Measuring Voltage 11-875
Measuring Voltage Drop 11-875
Measuring Frequency 11-875
Testing Ground and Low Reference Circuits 11-876
Testing for Continuity 11-876
Testing for Short to Ground 11-877

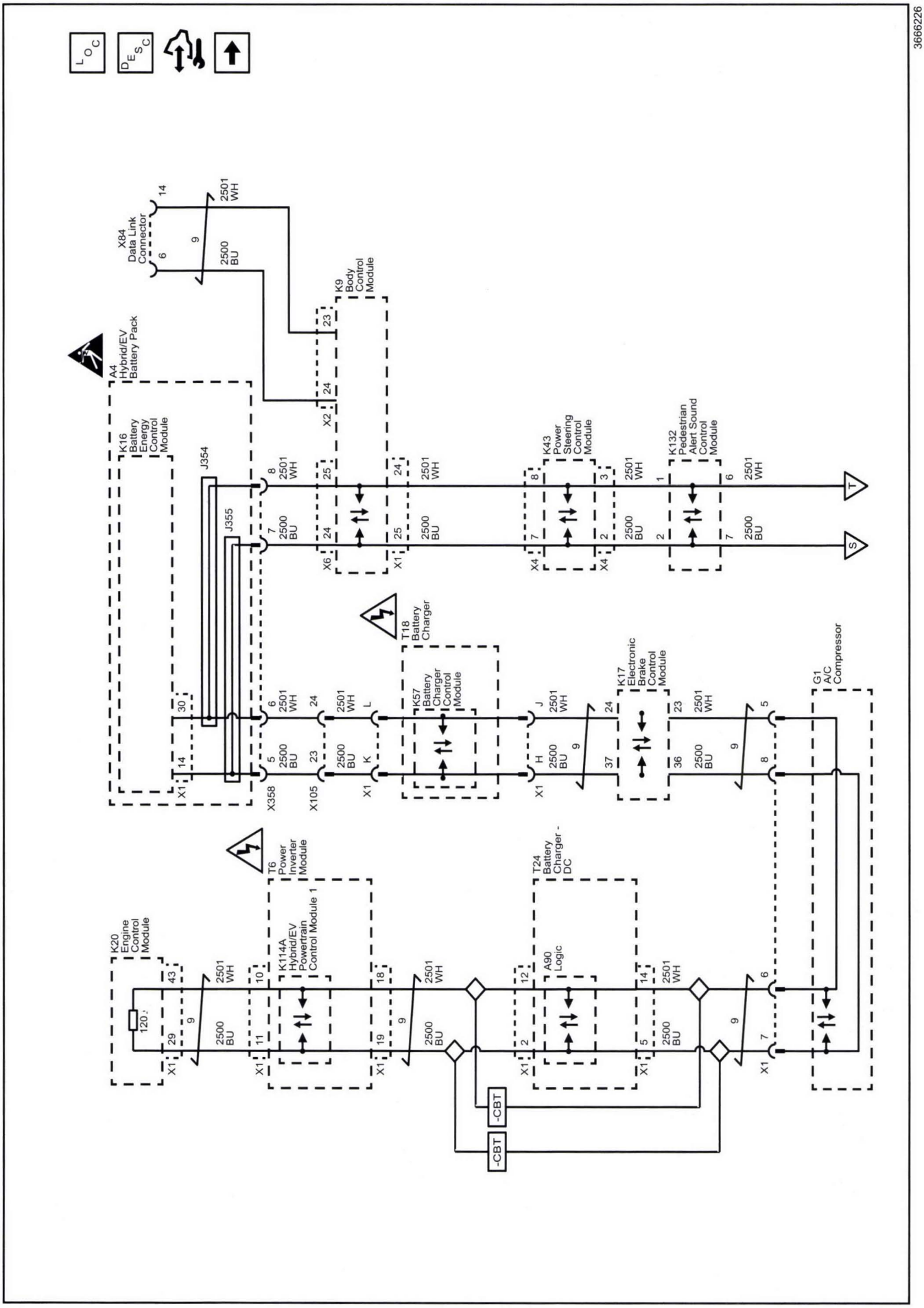
Testing for a Short to Voltage 11-877
Testing for Intermittent Conditions and Poor Connections 11-877
Inducing Intermittent Fault Conditions 11-879
Testing for Electrical Intermittents 11-880
Scan Tool Snapshot Procedure 11-881
Circuit Protection - Fuses 11-882
Circuit Protection - Circuit Breakers 11-883
Circuit Protection - Fusible Links 11-883
Wiring Repairs 11-883
Repairing Damaged Wire Insulation 11-883
Coaxial Cable Repairs 11-884
Flat Wire Repairs 11-887
Folded-Over Wire Repair 11-887
High Temperature Wiring Repairs 11-889
Heated Oxygen Sensor Wiring Repairs 11-890
Splicing Copper Wire Using Splice Sleeves 11-890
Splicing Twisted or Shielded Cable 11-893
Splicing Inline Harness Diodes 11-894
SIR/SRS Wiring Repairs 11-894
Connector Repairs 11-895
Connector Position Assurance Locks 11-898
Terminal Position Assurance Locks 11-898
AFL/EPC Connectors 11-898
Bosch Connectors (BSK) 11-901
Bosch Connectors (0.64) 11-901
Bosch Connectors (2.8 JPT) 11-903
Bosch Connectors (ECM) 11-903
Delphi Connectors (Weather Pack) 11-905
Delphi Connectors (Push To Seat) 11-906
Delphi Connectors (Pull To Seat) 11-907
Delphi Connectors (Micro-Pack 100W) 11-908
Delphi Connectors (Micro .64) 11-910
Delphi Connectors (12-Way) 11-913
Delphi Connectors (Steering Gear) 11-915
FCI Connectors (Lever Lock) 11-916
FCI Connectors (SIR) 11-917
FEP Connectors (Steering Gear) 11-918
JST Connectors 11-919
Kostal Connectors (Glow Plug Control Module) 11-921
Kostal Connectors (Transmission) 11-923
Molex Connectors 11-925
Molex Connectors (SIR) 11-927
Sumitomo Connectors 11-928
Tyco/AMP Connectors (CM 42-Way) 11-930
Tyco/AMP Connectors (Sensor) 11-932
Tyco/AMP Connectors (0.25 Cap) 11-932
Tyco/AMP Connectors (43-Way) 11-934
Tyco/AMP Connectors (Door Module) 11-935
Tyco/AMP Connectors (102-Way Inline) 11-937
Tyco/AMP Connectors (Seat) 11-943
Tyco/AMP Connectors (SIR) 11-945
Yazaki Connectors (2-Way) 11-947
Yazaki Connectors (16-Way) 11-947
Repairing Connector Terminals (Terminated Lead Repair) 11-949
Repairing Connector Terminals (Terminal Repair) 11-949
Terminal Removal 11-951
Repair Instructions 11-952
GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs 11-952
Relay Replacement (Attached to Wire Harness) 11-953
Relay Replacement (Within an Electrical Center) 11-953
Ground Repair 11-954
Ignition and Start Switch Replacement 11-957
Description and Operation 11-958
Electronic Park Lock Description and Operation 11-958
Power Mode Description and Operation 11-958
Retained Accessory Power Description and Operation 11-962
Special Tools and Equipment 11-963

BLANK

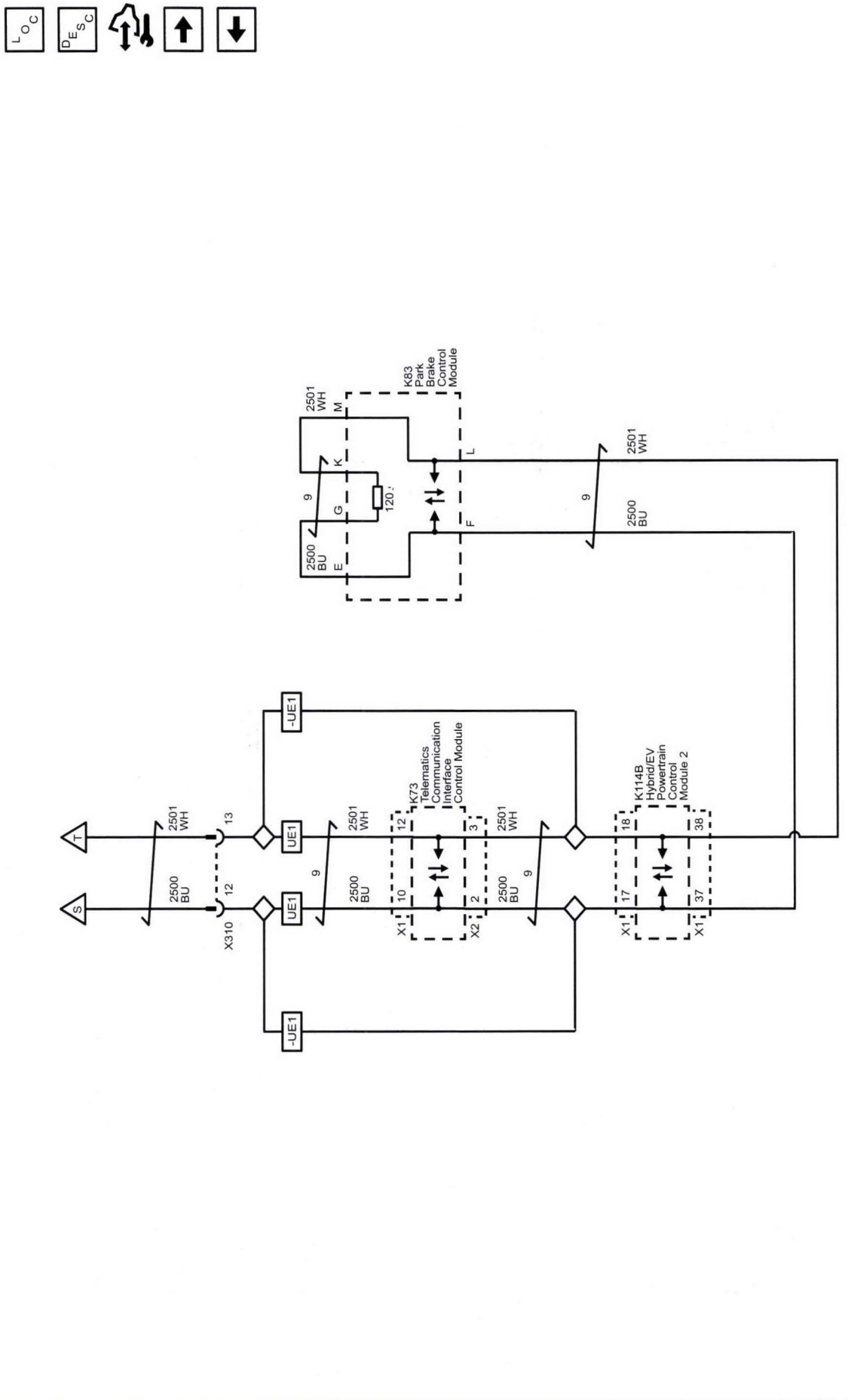
Data Communications

Schematic and Routing Diagrams

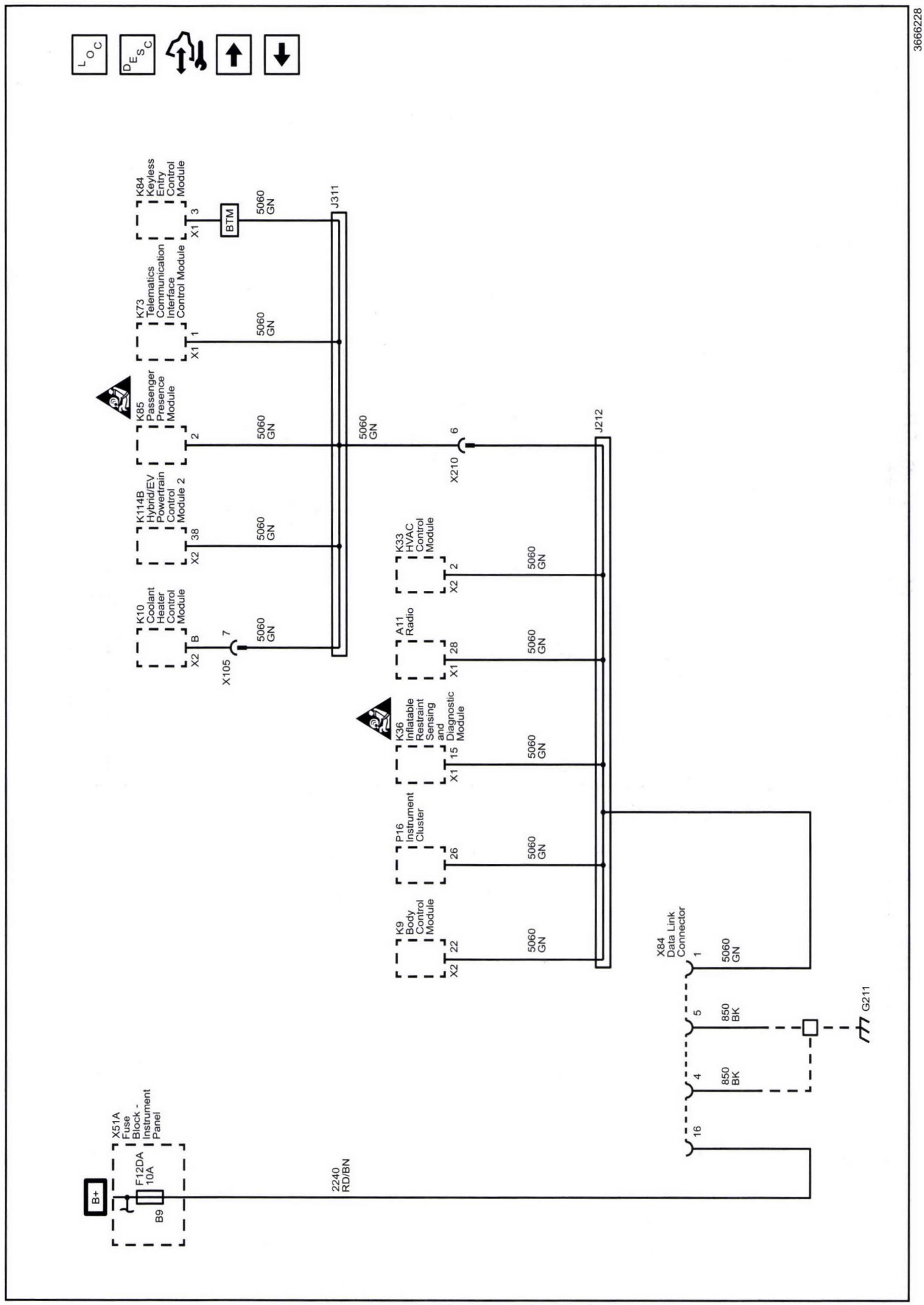
Data Communication Schematics (High Speed GMLAN (1 of 2))



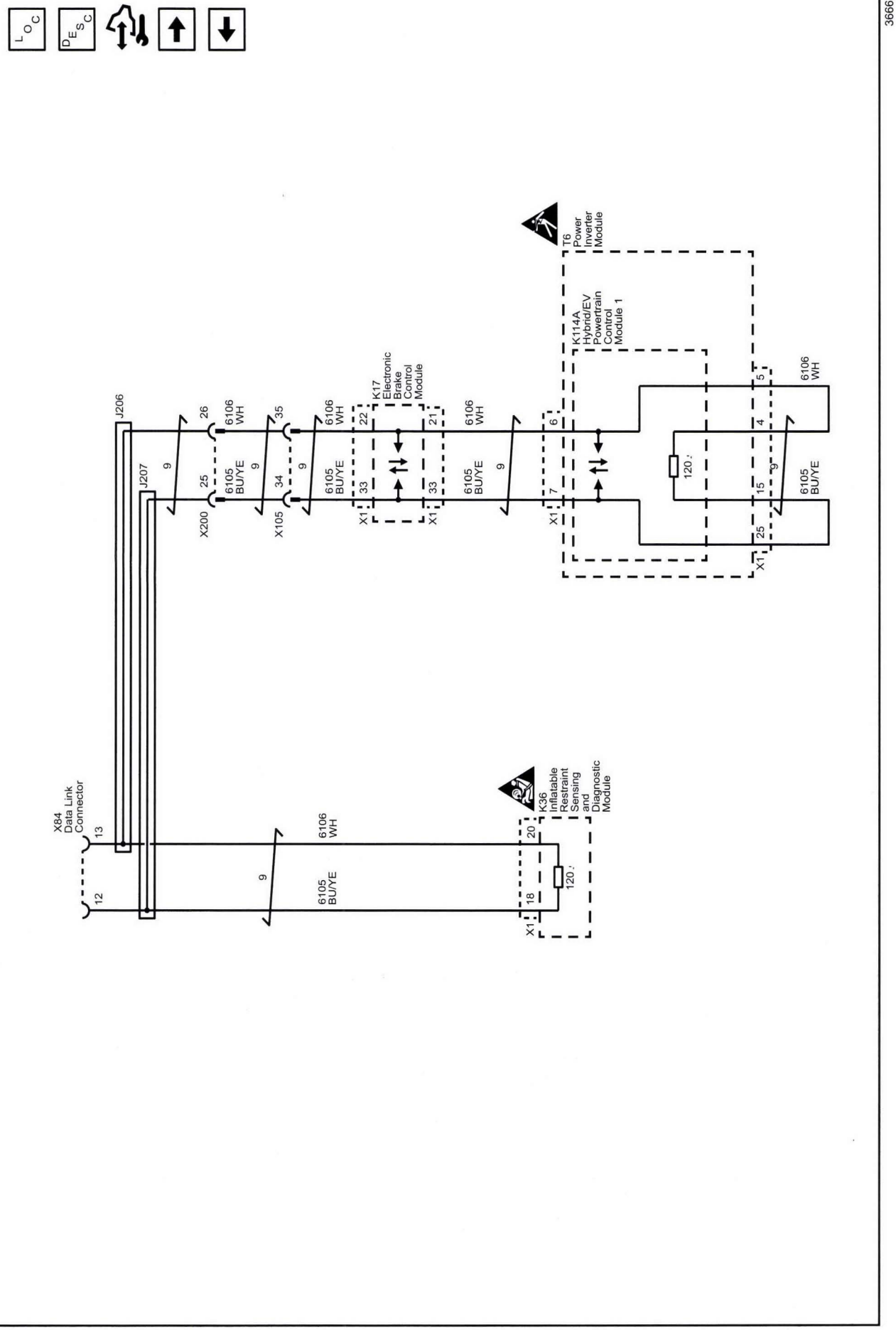
Data Communication Schematics (High Speed GMLAN (2 of 2))



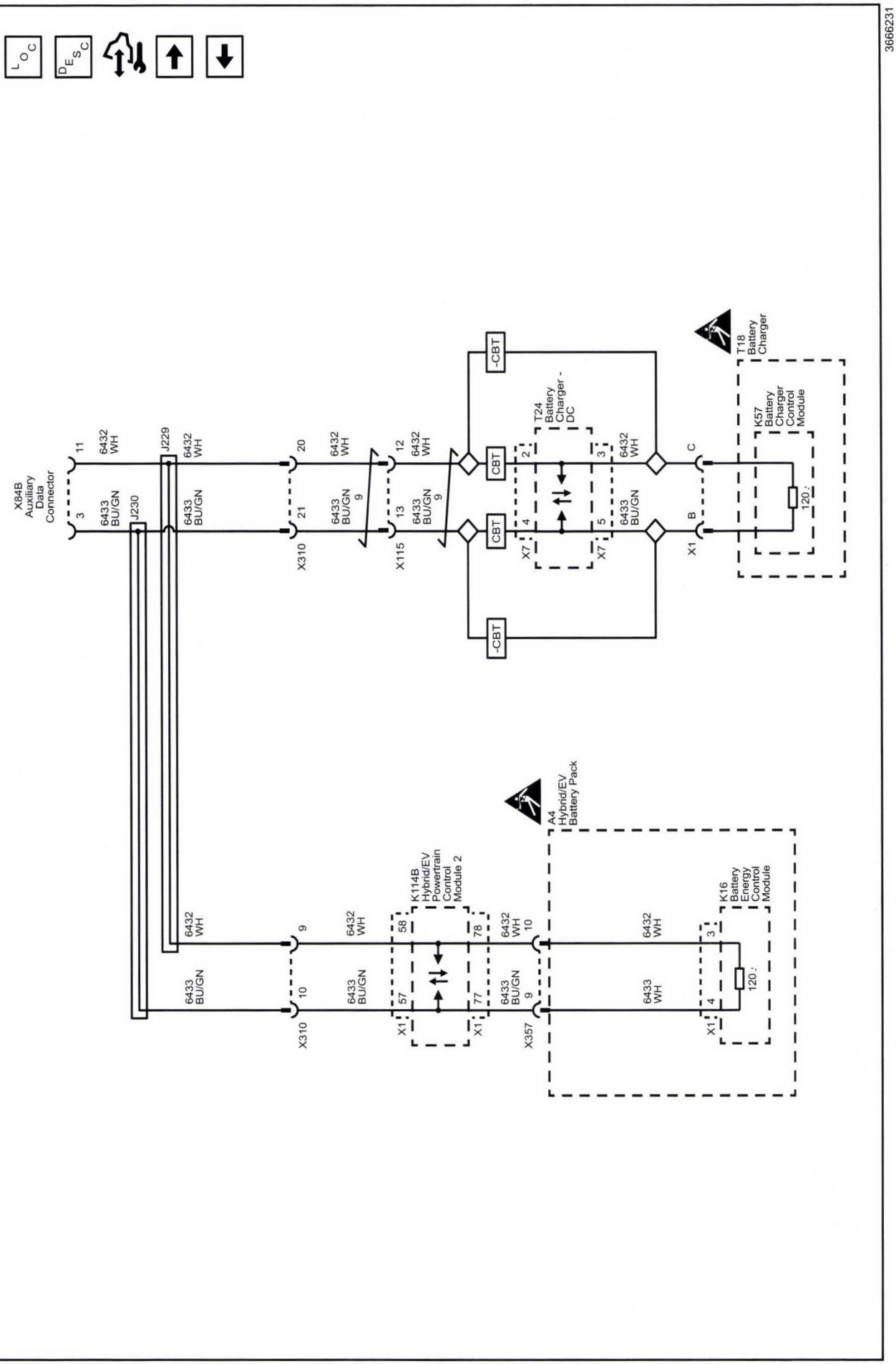
Data Communication Schematics (Low Speed GMLAN)



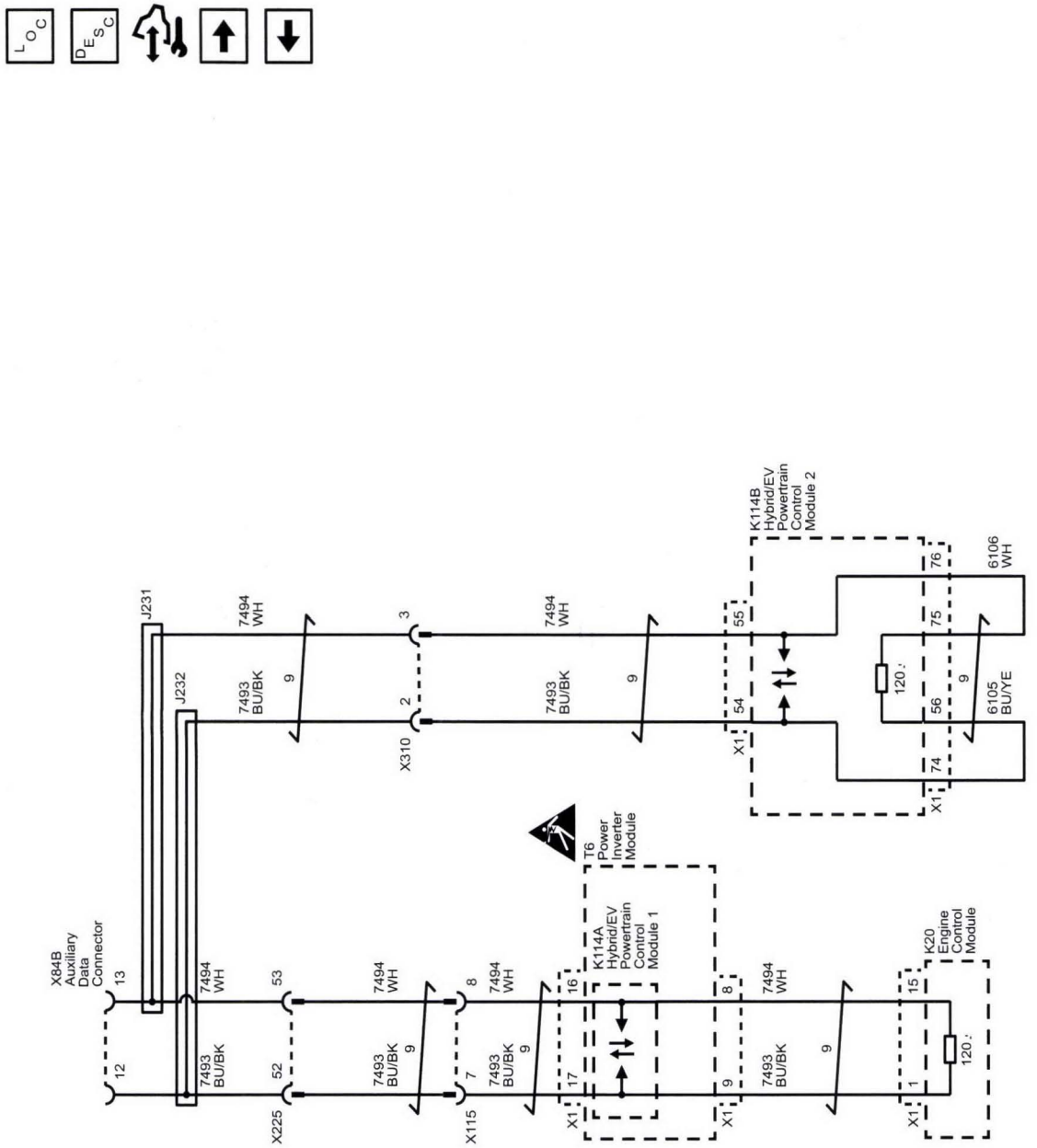
Data Communication Schematics (Chassis Expansion Bus)



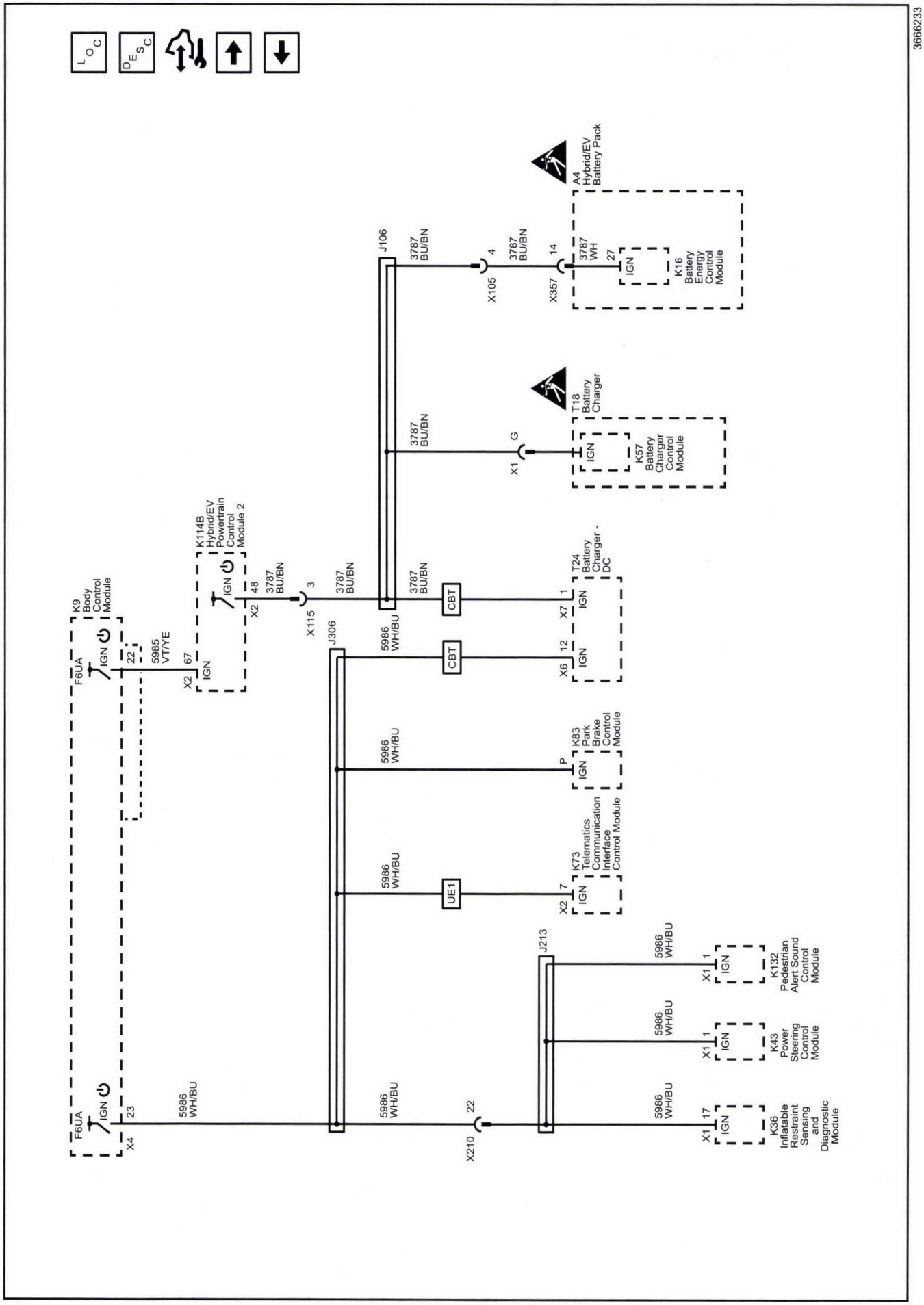
Data Communication Schematics (High Voltage Management Bus)



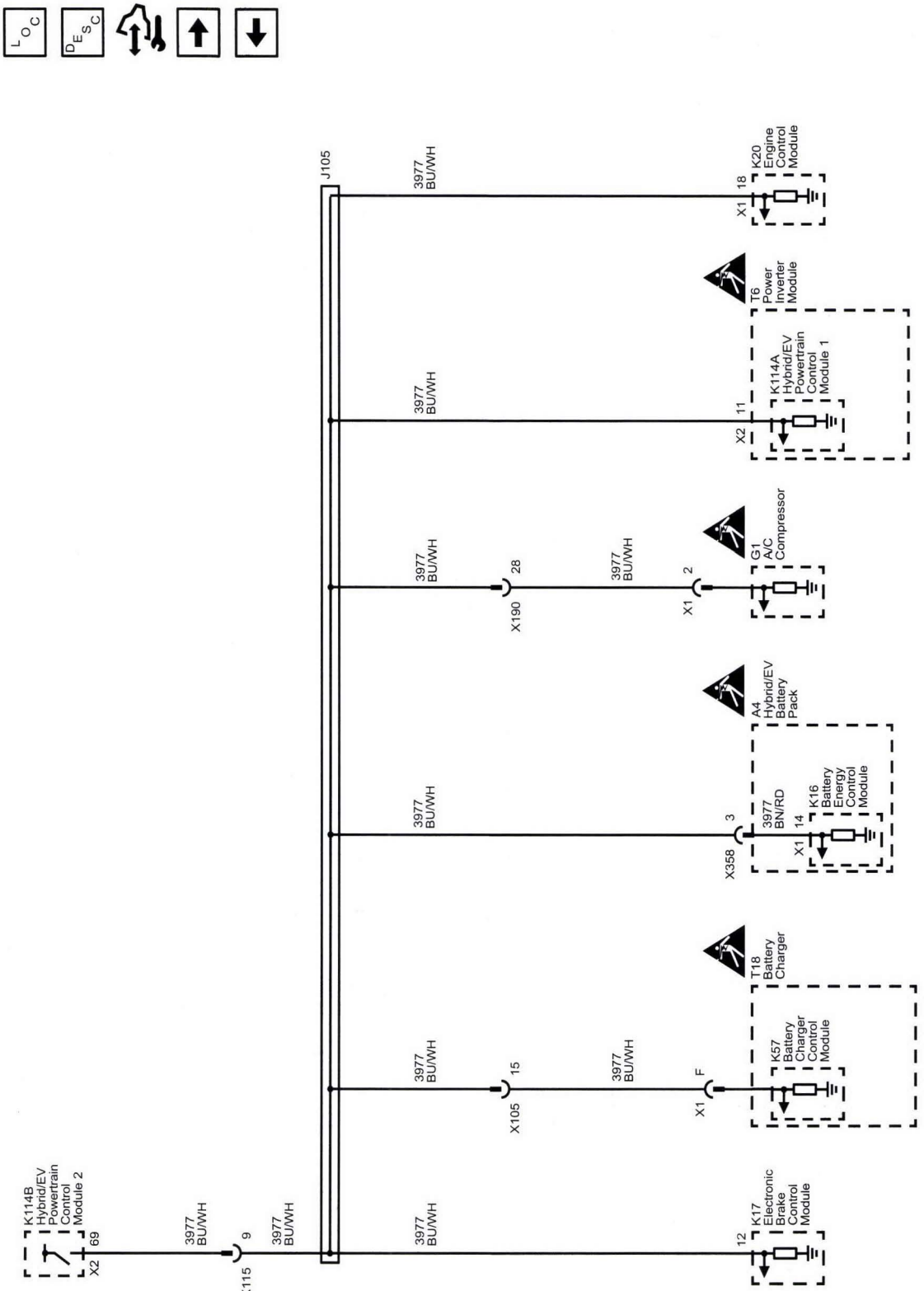
Data Communication Schematics (Powertrain Expansion Bus)



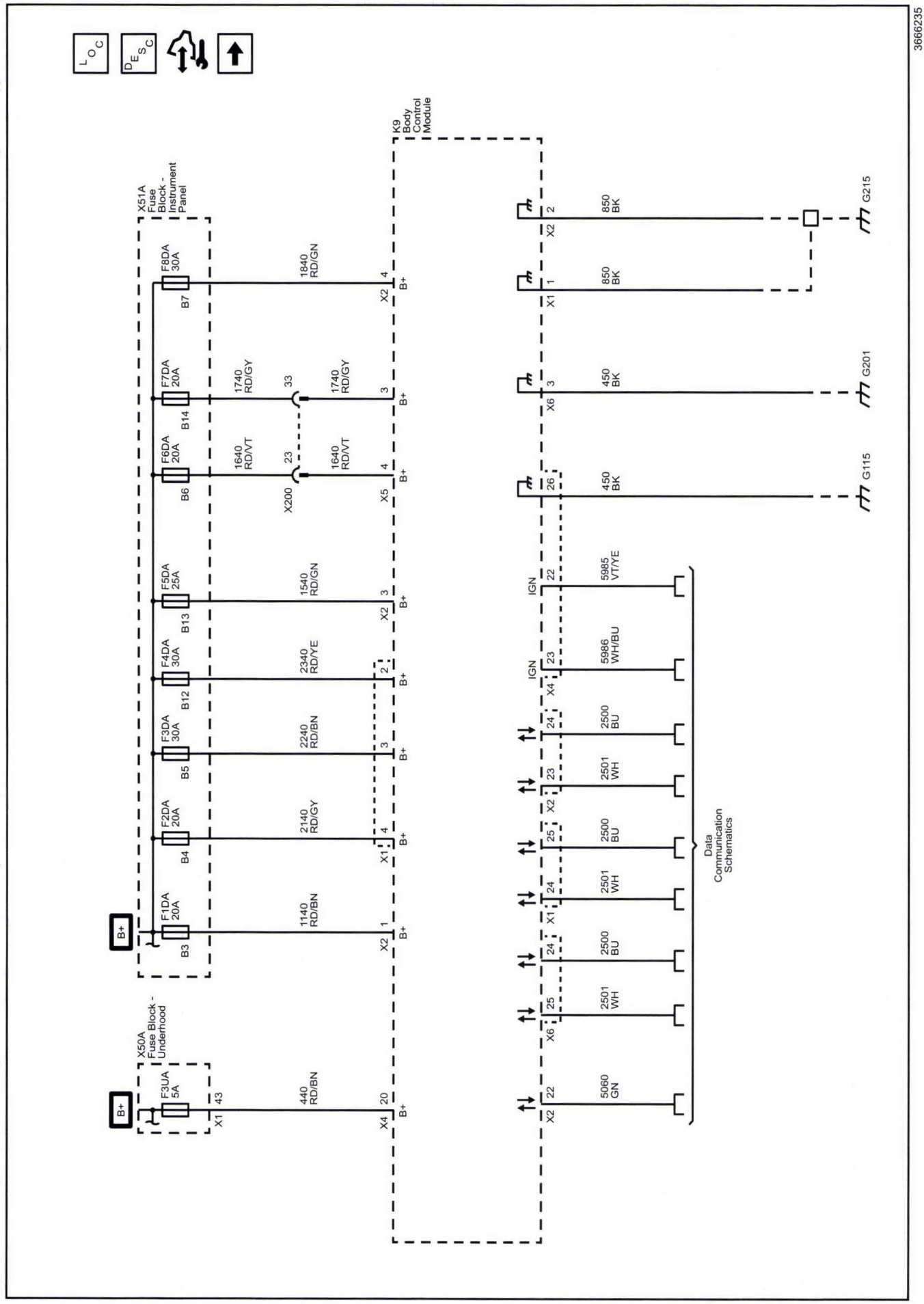
Data Communication Schematics (GMLAN Communication Enable)



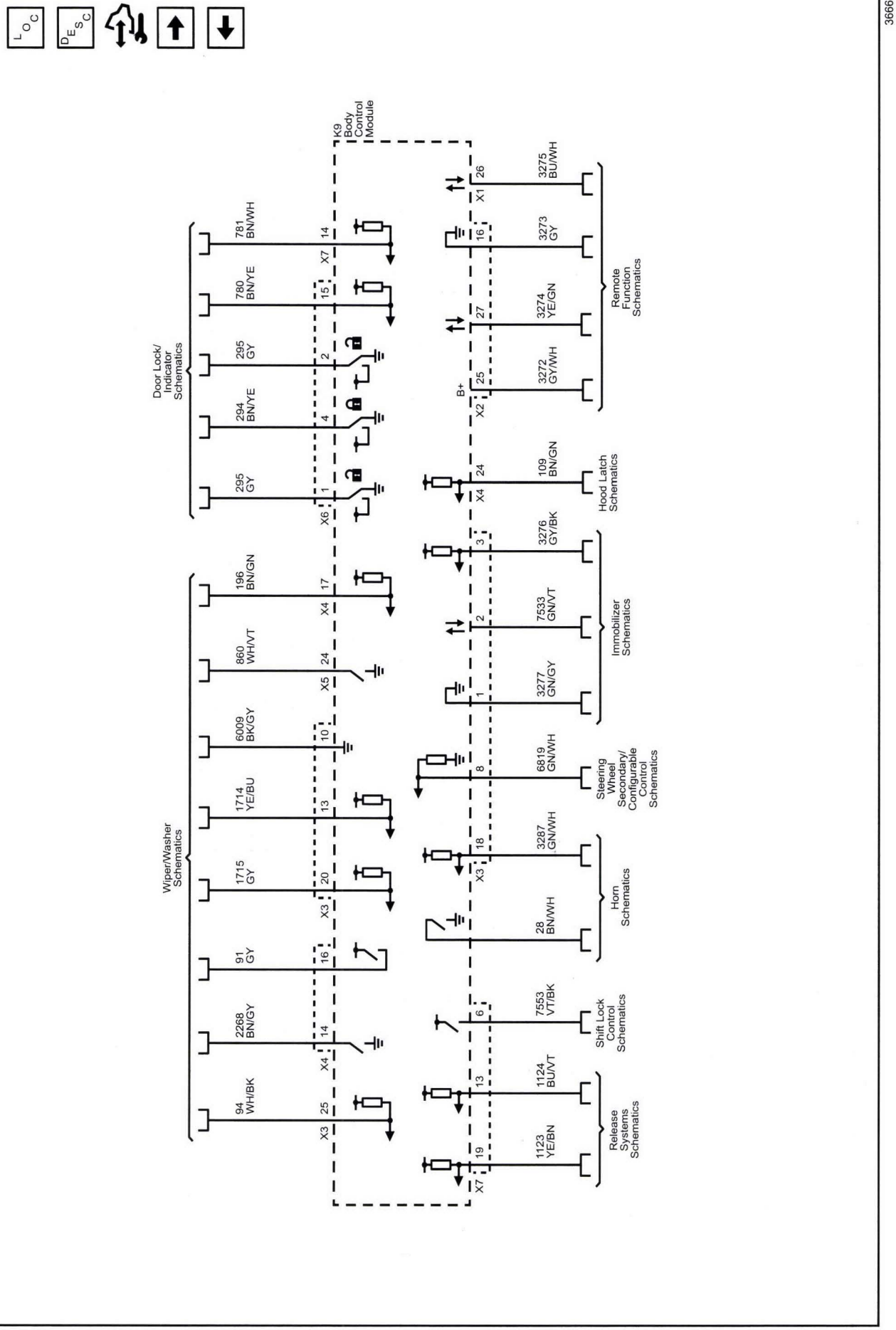
Data Communication Schematics (Serial Data Wake-Up)



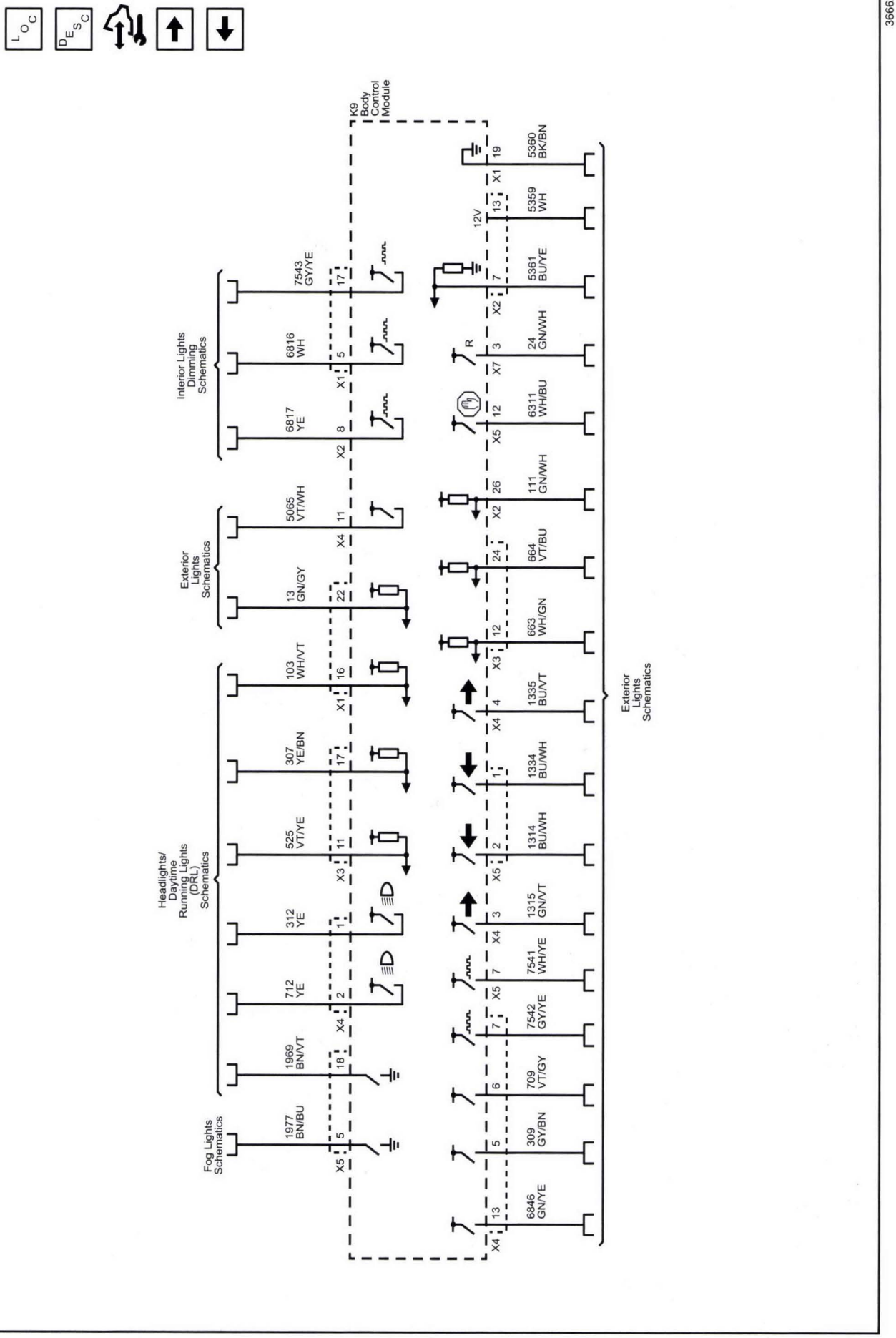
Body Control System Schematics (Power, Ground, Data Communications, and Subsystem References (1 of 4))



Body Control System Schematics (Subsystem References (2 of 4))

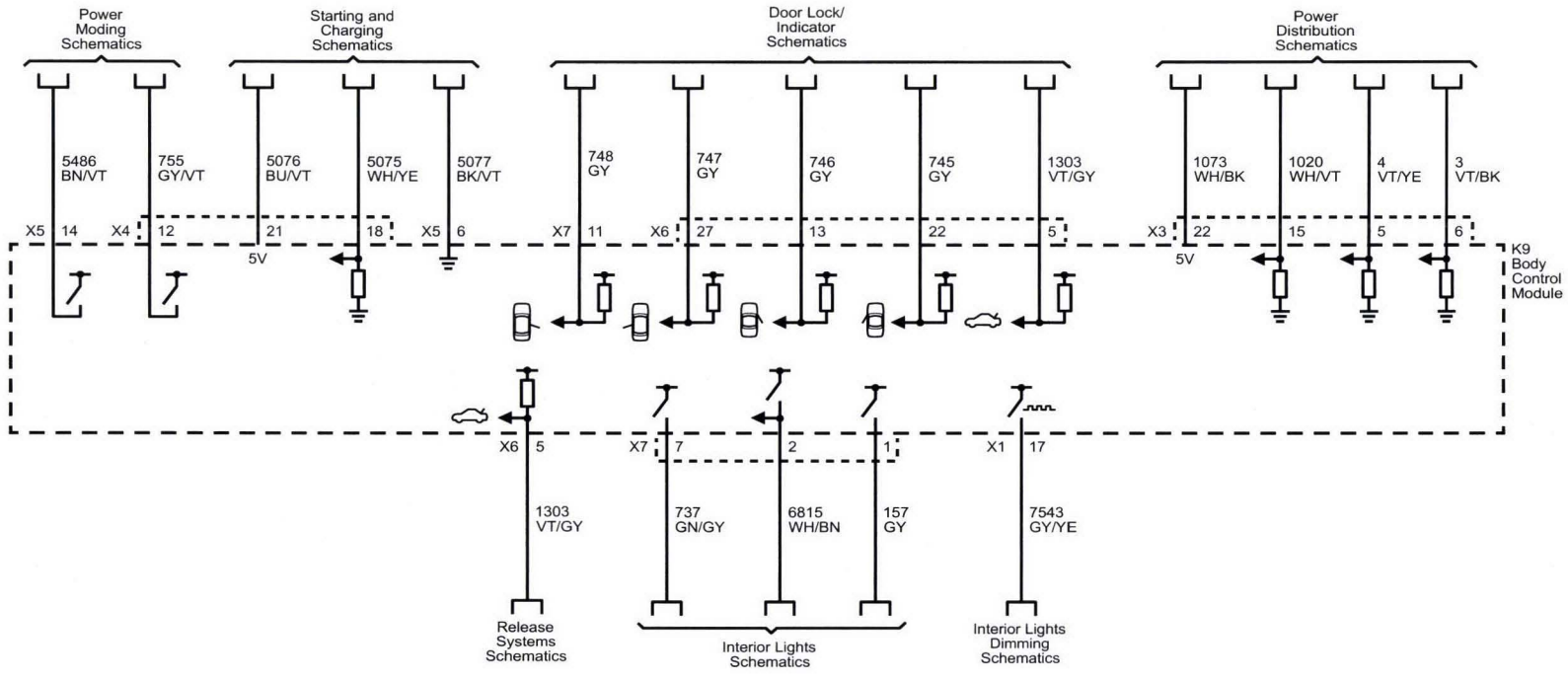


Body Control System Schematics (Subsystem References (3 of 4))



3666237

Body Control System Schematics (Subsystem References (4 of 4))



Diagnostic Information and Procedures

Control Module U Code List

This list includes all Data Communications related U-code DTCs in alphanumeric order with descriptors for all devices. Not all DTCs listed will be applicable to all vehicles.

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Control Module U Code List

DTC	DTC Descriptor
U0001	High Speed CAN Bus Malfunction
U0002	High Speed CAN Bus
U0009	High Speed CAN Bus [-] Shorted to Bus [+]
U0020	Low Speed CAN Bus
U0028	MOST Bus
U0029	MOST Bus Performance
U0073	Control Module Communication Bus A Off
	Control Module Communication High Speed CAN Bus Off
U0074	Control Module Communication Bus B Off
U0075	Control Module Communication Object Detection CAN Bus Off
U0077	Control Module Communication Chassis Expansion CAN Bus Off
U0078	Control Module Communication Low Speed CAN Bus Off
U007A	Control Module Communication High Voltage Energy Management CAN Bus Off
U007B	Control Module Communication High Speed Extension CAN Bus Off
U007C	Control Module Communication High Speed Extension CAN Bus 2 Off
U007D	Control Module Communication Low Speed Extension CAN Bus Off
U0100	Lost Communication With Engine Control Module
U0101	Lost Communication With Transmission Control Module
U0102	Lost Communication with Transfer Case Control Module
U0103	Lost Communication with Shift Lever Module
U0104	Lost Communication With Cruise Control Module
U0105	Lost Communication with Fuel Injector Control Module
U0106	Lost Communication with Glow Plug Control Module
U0109	Lost Communication with Fuel Pump Control Module *(2013 and prior)*
	Lost Communication with Chassis Control Module *(2014 and beyond)*
U010E	Lost Communication with Reductant Sensor Module
U010F	Lost Communication with Air Conditioning Control Module
U0111	Lost Communication with Battery Energy Control Module
U0112	Lost Communication with Battery Energy Control Module
U0115	Lost Communication with Engine Control Module B
U0117	Lost Communication With Power Take-Off Control Module
U0121	Lost Communication With Electronic Brake Control Module
U0122	Lost Communication With Vehicle Stability Control Module
U0123	Lost Communication with Yaw Rate Sensor Module
U0125	Lost Communication With Multi-axis Acceleration Sensor Module
U0126	Lost Communication With Steering Wheel Angle Sensor Module

Control Module U Code List (cont'd)

DTC	DTC Descriptor
U0128	Lost Communication With Park Brake Control Module
U0129	Lost Communication with Brake System Control Module
U012A	Lost Communication With Chassis Control Module
U0130	Lost Communication With Electric Power Steering Control Module
U0131	Lost Communication With Power Steering Control Module
U0132	Lost Communication With Suspension Control Module
U0133	Lost Communication With Air Suspension Control Module
U0134	Lost Communication with Power Steering Control Module - Rear
U0136	Lost Communication With Differential Control Module - Rear
U0137	Lost Communication with Trailer Brake Control Module
U0139	Lost Communication With Suspension Control Module
U0140	Lost Communication With Body Control Module
U0146	Lost Communication with Serial Data Gateway Module
U0151	Lost Communication With Inflatable Restraint Sensing and Diagnostic Module
U0155	Lost Communication With Instrument Cluster
U0158	Lost Communication With Head-Up Display
U0159	Lost Communication With Parking Assist Control Module
U0160	Lost Communication With Chime Alarm Control Module
U0164	Lost Communication with HVAC Control Module
U0166	Lost Communication with Auxiliary Heater Control Module
U0167	Lost Communication with Immobilizer Control Module
U0168	Lost Communication With Keyless Entry Control Module
U016B	Lost Communication with Electric A/C Compressor Control Module
U0170	Lost Communication with Passenger Presence Detection Sensor Module
U0181	Lost Communication With Headlamp Leveling Control Module
U0182	Lost Communication With Lighting Control Module - Front
U0184	Lost Communication With Radio
U0186	Lost Communication With Speaker Amplifier Module
U0196	Lost Communication With Rear Audio Control Module
U0191	Lost Communication With Television
U0193	Lost Communication With Digital Radio Receiver Control Module
U0197	Lost Communication With Telephone Control Module
U0198	Lost Communication With Telematic Control Module
U01B0	Lost Communication with Battery Monitor Module
U0201	Lost Communication With Transfer Case Control Module
U0203	Lost Communication With Left Rear Door Switch Panel Control Module
U0204	Lost Communication With Right Rear Door Switch Panel Control Module
U0207	Lost Communication With Moveable Roof Control Module
U0208	Lost Communication with Seat Memory Control Module
U0209	Lost Communication With Front Seat Heating Control Module
U0210	Lost Communication With Rear Seat Heating Control Module
U0230	Lost Communication With Liftgate Control Module
U0231	Lost Communication with Rain Sensor Module
U0232	Lost Communication with Side Object Detection Control Module - Left
U0233	Lost Communication with Side Object Detection Control Module - Right

Control Module U Code List (cont'd)

DTC	DTC Descriptor
U0236	Lost Communication With Steering Column Lock Module
U0237	Lost Communication With Multimedia Player Interface Module
U023A	Lost Communication With Vehicle Direction Camera Control Module *(without UGN)*
	Lost Communication With Active Safety Control Module 1 *(with UGN)*
U023C	Lost Communication with Night Vision Camera Control Module
U0248	Lost Communication with Remote Accessory Module
U0249	Lost Communication with Entertainment Control Module - Rear
U0250	Lost Communication with Impact Classification System Module
U0252	Lost Communication With Trailer Interface Control Module
U0254	Lost Communication With Remote Start Module
U0255	Lost Communication With Info Display Module
U0256	Lost Communication With Infotainment Faceplate Control Module
U0257	Lost Communication With Info Display Module/Infotainment Faceplate Control Module
U025B	Lost Communication with Special Purpose Vehicle Control Module "C"
U0264	Lost Communication With Camera Module - Rear
U0265	Lost Communication with Left Front Short Range Radar Sensor Module
U0268	Lost Communication with Right Front Short Range Radar Sensor Module
U0269	Lost Communication with Front Long Range Object Sensor
U026A	Lost Communication with Frontview Camera Module
U026B	Lost Communication with Rear Short Range Object Sensor
	Lost Communication with Left Rear Short Range Radar Sensor Module
U026C	Lost Communication with Right Rear Short Range Radar Sensor Module
U026D	Lost Communication with Rear Middle Short Range Radar Sensor Module
U0293	Lost Communication with Hybrid/EV Powertrain Control Module
U029D	Lost Communication with NOx Sensor 1 Module
U029E	Lost Communication with NOx Sensor 2 Module
U02A3	Lost Communication With Particulate Matter Sensor Module
U0301	Software Incompatibility with Engine Control Module
U0302	Software Incompatibility with Transmission Control Module
U0305	Software Incompatibility With Cruise Control Module
U0315	Software Incompatibility with Electronic Brake Control Module
U031C	Software Incompatibility With Brake System Control Module 2
U0401	Invalid Data Received From Engine Control Module
U0402	Invalid Data Received From Transmission Control Module
U0403	Invalid Data Received From Transfer Case Control Module
U0405	Invalid Data Received From Cruise Control Module
U0415	Invalid Data Received From Electronic Brake Control Module
U0416	Invalid Data Received From Vehicle Dynamics Control Module
U0417	Invalid Data Received From Park Brake Control Module
U0418	Invalid Data Received From Brake System Control Module
U0420	Invalid Data Received From Power Steering Control Module
U0421	Invalid Data Received From Suspension Control Module
U0422	Invalid Data Received From Body Control Module
U0423	Invalid Data Received From Instrument Cluster
U0424	Invalid Data Received From HVAC Control Module

Control Module U Code List (cont'd)

DTC	DTC Descriptor
U0428	Invalid Data Received From Steering Wheel Angle Sensor Module
U042B	Invalid Data Received From Chassis Control Module
U0431	Invalid Data Received From Body Control Module "A"
U0432	Invalid Data Received From Multi-axis Acceleration Sensor Module
U0437	Invalid Data Received From Differential Control Module - Rear
U0438	Invalid Data Received From Trailer Brake Control Module
U0447	Invalid Data Received from Central Gateway Module
U0452	Invalid Data Received From Inflatable Restraint Sensing and Diagnostic Module
U045A	Invalid Data Received From Parking Assist Control Module "A"
U0465	Invalid Data Received From Power Take-Off Control Module
U0499	Invalid Data Received From Telematic Control Module
U0513	Invalid Data Received From Yaw Rate Sensor Module
U053B	Invalid Data Received From Active Safety Control Module 1
U056B	Invalid Data Received From Frontview Camera Module
U0594	Invalid Data Received From Hybrid/EV Powertrain Control Module
U1347	Engine Control Module LIN Bus 3
U135B	Lost Communication with Sunload Sensor
U135C	Lost Communication with Start-Stop Capacitor Control Module
U1501	LIN Bus
U1502	LIN Bus
U1505	LIN Bus
U1509	LIN Bus
	A26 HVAC Controls / P17 Info Display Module Lost Communication with K33 HVAC Control Module on LIN Bus
U150E	LIN Bus
	A22 Radio Controls / P17 Info Display Module Lost Communication with A11 Radio on LIN Bus
U150F	LIN Bus
	A22 Radio Controls / P17 Info Display Module Lost Communication with K74 Human Machine Interface Control Module on LIN Bus
	K161 Vehicle Performance Data Recorder Lost Communication with K74 Human Machine Interface Control Module on LIN Bus
U1510	A11 Radio Lost Communication with A20 Radio/HVAC Control / P17 Info Display Module on LIN Bus
	K9 Body Control Module Lost Communication with B67 Ultrasonic Intrusion Sensor / B165 Content Theft Deterrent Sensor Module on LIN Bus
	K20 Engine Control Module Lost Communication with M96 Active Grille Air Shutter Actuator on LIN Bus
	K33 HVAC Control Module Lost Communication with A26 HVAC Controls / A20 Radio/HVAC Controls / P17 Info Display Module on LIN Bus
	K33 HVAC Control Module Lost Communication with A34 HVAC Controls – Auxiliary on LIN Bus
	K39 Liftgate Control Module Lost Communication with K171 Hands-Free Liftgate Sensor Control Module / S45A Liftgate Control Switch – Exterior on LIN Bus
	P16 Instrument Cluster Lost Communication with S70R Steering Wheel Controls Switch - Right on LIN Bus
U1511	K26 Headlamp Control Module / K28 Headlamp Leveling Control Module Lost Communication with E13L Headlamp - Left on LIN Bus
	K40 Seat Memory Control Module Lost Communication with K99 Steering Column Position Control Module on LIN Bus
U1512	K26 Headlamp Control Module / K28 Headlamp Leveling Control Module Lost Communication with E13R Headlamp - Right on LIN Bus

Control Module U Code List (cont'd)

DTC	DTC Descriptor
U1513	K26 Headlamp Control Module / K28 Headlamp Leveling Control Module Lost Communication with E13L Headlamp - Left on LIN Bus
U1514	K26 Headlamp Control Module / K28 Headlamp Leveling Control Module Lost Communication with E13R Headlamp - Right on LIN Bus
U1515	K9 Body Control Module Lost Communication with M75 Windshield Wiper Motor / M75L Windshield Wiper Motor Module – Left on LIN Bus
U1516	K9 Body Control Module Lost Communication with B110 Battery Sensor Module on LIN Bus
U1517	K9 Body Control Module Lost Communication with K62 Sunroof Sunshade Motor Module on LIN Bus
U1518	P16 Instrument Cluster Lost Communication with K78 Head-Up Display Module / P29 Head-Up Display on LIN Bus
U1519	K40 Seat Memory Control Module Lost Communication with S52 Outside Rearview Mirror Switch on LIN Bus
	K40 Seat Memory Control Module Lost Communication with K96 Mirror Control Module / K96D Mirror Control Module – Driver / K96L Mirror Control Module – Left on LIN Bus
U151A	K9 Body Control Module Lost Communication with B117 Rain Sensor / B177 Rain/Ambient Light Sensor Module / B200 Rain Sensor Module on LIN Bus
U151B	K9 Body Control Module Lost Communication with K61 Sunroof Control Module on LIN Bus
	K40 Seat Memory Control Module Lost Communication with S79P Window Switch - Passenger on LIN Bus
U151C	K33 HVAC Control Module Lost Communication with K33A HVAC Control Module – Auxiliary on LIN Bus
U1520	K9 Body Control Module Lost Communication with P4 Security Siren / P25 Power Sounder Content Theft Deterrent Alarm Module on LIN Bus
U1521	K9 Body Control Module Lost Communication with S48E Multifunction Switch – Center Console on LIN Bus
	K26 Headlamp Control Module / K28 Headlamp Leveling Control Module Lost Communication with E13L Headlamp - Left on LIN Bus
U1522	K9 Body Control Module Lost Communication with K65 Tire Pressure Indicator Module / B178 Tire Pressure Sensor Locator Module on LIN Bus
	K26 Headlamp Control Module / K28 Headlamp Leveling Control Module Lost Communication with E13R Headlamp - Right on LIN Bus
U1523	K26 Headlamp Control Module / K28 Headlamp Leveling Control Module Lost Communication with E13L Headlamp - Left on LIN Bus
U1524	K9 Body Control Module Lost Communication with K29 Seat Heating Control Module / K29F Seat Heating Control Module – Front on LIN Bus
	K26 Headlamp Control Module / K28 Headlamp Leveling Control Module Lost Communication with E13R Headlamp - Right on LIN Bus
U1526	K9 Body Control Module Lost Communication with K29R Seat Heating Control Module – Rear on LIN Bus
U1528	K40D Seat Memory Control Module – Driver Lost Communication with S64D Seat Adjuster Switch - Driver on LIN Bus
	K40P Seat Memory Control Module – Passenger Lost Communication with S64P Seat Adjuster Switch - Passenger on LIN Bus
U152C	K9 Body Control Module Lost Communication with K18 Compass Module on LIN Bus
U152D	K9 Body Control Module Lost Communication with P2 Transmission Shift Lever Position Indicator on LIN Bus
U1530	K9 Body Control Module Lost Communication with M35P Window Motor Module - Passenger / M74P Window Motor - Passenger on LIN Bus
U1531	K26 Headlamp Control Module / K28 Headlamp Leveling Control Module Lost Communication with E13LA Headlamp Assembly - Left on LIN Bus
U1532	K26 Headlamp Control Module / K28 Headlamp Leveling Control Module Lost Communication with E13RA Headlamp Assembly - Right on LIN Bus
U1534	K9 Body Control Module Lost Communication with M74D Window Motor - Driver on LIN Bus
U1538	K9 Body Control Module Lost Communication with S79D Window Switch - Driver on LIN Bus

Control Module U Code List (cont'd)

DTC	DTC Descriptor
U153A	K9 Body Control Module Lost Communication with S79P Window Switch - Passenger on LIN Bus
U1540	K9 Body Control Module Lost Communication with M74RR Window Motor - Right Rear on LIN Bus
U1544	K9 Body Control Module Lost Communication with M74LR Window Motor - Left Rear on LIN Bus
U1548	K9 Body Control Module Lost Communication with S79LR Window Switch - Left Rear on LIN Bus
U1549	K9 Body Control Module Lost Communication with M45 Rear Wiper Motor on LIN Bus
U154A	K9 Body Control Module Lost Communication with S79RR Window Switch - Right Rear on LIN Bus
U154B	K9 Body Control Module Lost Communication with K49 Rear Seat Control Module on LIN Bus
U1550	K9 Body Control Module Lost Communication with S31D Seat Heating and Cooling Switch – Driver on LIN Bus
U1556	K38 Chassis Control Module Lost Communication with K133 Trailer Brake Power Control Module on LIN Bus
U1558	K9 Body Control Module Lost Communication with S31P Seat Heating and Cooling Switch – Passenger on LIN Bus
U15E1	A11 Radio Lost Communication with A26 HVAC Controls / P17 Info Display Module on LIN Bus
U15F0	K74 Human Interface Control Module Lost Communication with P17 Info Display Module on LIN Bus
U1793	14V Power Module Lost Communication with Hybrid/EV Powertrain Control Module on Powertrain Expansion Communication Bus
U1795	14V Power Module Powertrain Expansion Communication Bus Off
U179A	Lost Communication with Hybrid/EV Powertrain Control Module 2
U179D	Lost Communication with Brake System Control Module 2 on Chassis Expansion Bus
U1803	Lost Communication with Hybrid/EV Powertrain Control Module 2
U1804	Lost Communication with Inside Rearview Mirror Control Module
U1806	Battery Energy Control Module High Voltage Energy Management CAN Bus Off
U1807	Battery Charger Control Module High Voltage Energy Management CAN Bus Off
U180A	Electric A/C Compressor Control Module High Speed CAN Bus Off
U180B	Battery Energy Control Module High Speed CAN Bus Off
U180C	Battery Charger Control Module High Speed CAN Bus Off
U180D	Electronic Brake Control Module Chassis Expansion CAN Bus Off
U1811	Battery Energy Control Module Powertrain Expansion CAN Bus Off
U1814	Powertrain Wake-Up Communication Circuit
U1815	Lost Communication with Drive Motor Control Module 1 on Bus B
U1816	Lost Communication with Drive Motor Control Module B on Bus B
U1817	Lost Communication with Hybrid/EV Powertrain Control Module on Powertrain Expansion CAN Bus
U1818	Lost Communication with Engine Control Module on Powertrain Expansion Communication Bus
U1821	Lost Communication with 14V Power Module on Powertrain Expansion Communication Bus
U1826	Lost Communication with Multi-Axis Acceleration Sensor Module on Powertrain Expansion CAN Bus
U1827	Lost Communication with Steering Angle Sensor Module on Powertrain Expansion CAN Bus
U182A	Hybrid/EV Powertrain Control Module Lost Communication with Battery Energy Control Module on Powertrain Expansion CAN Bus
U182D	Lost Communication with Hybrid/EV Powertrain Control Module 2 on Powertrain Expansion Communication Bus
U182E	Drive Motor Control Module 1 Lost Communication with Hybrid/EV Powertrain Control Module 2 on Powertrain Expansion Communication Bus
U182F	Drive Motor Control Module 2 Lost Communication with Hybrid/EV Powertrain Control Module 2 on Powertrain Expansion Communication Bus
U1831	Drive Motor Control Module 1 Lost Communication with Hybrid/EV Powertrain Control Module on Powertrain Expansion CAN Bus
U1833	Lost Communication with Electronic Brake Control Module on Chassis Expansion CAN Bus

Control Module U Code List (cont'd)

DTC	DTC Descriptor
U1838	Lost Communication with Battery Charger Control Module on High Voltage Energy Management CAN Bus
U1839	Auxiliary Transmission Fluid Pump Control Module Lost Communication with Engine Control Module
U183A	Lost Communication with Telematics Communication Interface Control Module on High Speed CAN Bus
U183B	Auxiliary Transmission Fluid Pump Control Module Lost Communication with Transmission Control Module
U183C	Auxiliary Transmission Fluid Pump Control Module Lost Communication with Hybrid/EV Powertrain Control Module 2 on Powertrain Expansion Communication Bus
U183E	Lost Communication with Telematics Communication Interface Control Module on Low Speed CAN Bus
U1844	Battery Energy Control Module Lost Communication with Hybrid/EV Powertrain Control Module on Bus B
U1845	Drive Motor Control Module 1 Lost Communication with Hybrid/EV Powertrain Control Module
U1846	Drive Motor Control Module 2 Lost Communication with Hybrid/EV Powertrain Control Module
U1847	Drive Motor Control Module 1 Lost Communication with Battery Energy Control Module on Powertrain Expansion CAN Bus
U1849	Drive Motor Control Module 1 Lost Communication with Transmission Control Module
U184A	Lost Communication with Body Control Module on Low Speed CAN Bus
U184B	Lost Communication with Remote Heater and Air Conditioning Control Module on Low Speed CAN Bus
U184C	Lost Communication with Instrument Cluster on Low Speed CAN Bus
U184D	Lost Communication with Radio on Low Speed CAN Bus
U184E	Lost Communication with Inflatable Restraint Sensing and Diagnostic Module on Low Speed CAN Bus
U184F	Electric A/C Compressor Control Module Lost Communication with Engine Control Module
U1850	Drive Motor Control Module 2 Lost Communication with Transmission Control Module
U1858	Electronic Brake Control Module Lost Communication with Hybrid/EV Powertrain Control Module on Chassis Expansion CAN Bus
U185A	Lost Communication with Battery Energy Control Module on High Voltage Energy Management CAN Bus
U185B	Battery Energy Control Module Lost Communication with Hybrid/EV Powertrain Control Module 2 on High Voltage Energy Management CAN Bus
U185C	Battery Charger Control Module Lost Communication with Hybrid/EV Powertrain Control Module 2 on High Voltage Energy Management CAN Bus
U185D	Fuel Injector Control Module Lost Communication with Engine Control Module
U185E	Fuel Injector Control Module Lost Communication with Body Control Module
U1860	Electric A/C Compressor Control Module Lost Communication with Hybrid/EV Powertrain Control Module 2
U1861	Battery Charger Control Module Lost Communication with Engine Control Module
U186A	Electronic Brake Control Module Lost Communication with Engine Control Module
U186B	Electronic Brake Control Module Lost Communication with Transmission Control Module
U1875	Drive Motor Control Module 1 Lost Communication with Battery Energy Control Module
U1876	Drive Motor Control Module 1 Lost Communication with Engine Control Module
U1879	Drive Motor Control Module 2 Lost Communication with Engine Control Module
U1885	Battery Energy Control Module Lost Communication with Hybrid/EV Powertrain Control Module
U1886	Battery Energy Control Module Lost Communication with Engine Control Module
U1888	Hybrid/EV Powertrain Control Module Lost Communication with Battery Energy Control Module
U18A1	Lost Communication with Coolant Temperature Control Module on High Voltage Energy Management CAN Bus
U18A2	Lost Communication with Fuel Pump Driver Control Module

Control Module U Code List (cont'd)

DTC	DTC Descriptor
U18A3	Lost Communication with Human Machine Interface Control Module
U18A4	Lost Communication with Hybrid/EV Battery DC Charging Communications Gateway Module on High Voltage Energy Management CAN Bus
U18A5	Lost Communication with Fuel Injector Control Module on Powertrain Expansion CAN Bus
U18A6	Lost Communication with Right Object Detection Control Module on Dedicated Bus 1
U18A7	Lost Communication with Power Supply Transformer on Powertrain Expansion CAN Bus
U18B5	Lost Communication With Hybrid Powertrain Control Module on Chassis Expansion CAN Bus
U18B9	Primary High Speed CAN Bus Subnet Configuration List
U18BF	Secondary High Speed CAN Bus Subnet Configuration List
U1900	Lost Communication With Speech to Text Interface Module
U1901	Lost Communication with Infotainment Multifunction Switch Module
U2098	MOST Communication Enable Circuit
U2099	High Speed Communication Enable Circuit
U209E	Object Detection Control Module High Speed Communication Enable Circuit 1
U209F	Object Detection Control Module High Speed Communication Enable Circuit 2
U2100	CAN Bus Communication
U2101	CAN Bus Maximum List of Control Modules
U2103	Fewer Controllers On Bus Than Programmed
U2105	Lost Communication with Engine Control Module
U2106	Lost Communication with Transmission Control Module
U2107	Lost Communication with Body Control Module
U2108	Lost Communication with Electronic Brake Control Module
U2125	Lost Communication with Telematic Unit
U2127	Lost Communication with Front HVAC Control Module
U2139	Lost Communication with Column Integration Module
U2144	Lost Communication with Distance Sensing Cruise Control Module
U216A	Lost Communication with Front Object Detection Control Module
U216B	Lost Communication with Rear Object Detection Control Module
U2176	Lost Communication with Power Take-Off Control Module
U2178	Lost Communication With Trailer Interface Control Module
U2400	Fuel Injector Control Module High Speed CAN Bus Off
U2401	Battery Energy Control Module Dedicated Bus 1 Off
U2501	Invalid Data Received From Hybrid/EV Powertrain Control Module 2
U2502	Invalid Data Received From Electronic Brake Control Module on Chassis Expansion CAN Bus
U2503	Invalid Data Received From Object Detection Control Module
U2504	Invalid Data Received From Trailer Brake Driver Control Module
U2505	Invalid Data Received from Human Machine Interface Control Module on MOST Bus
U2506	Invalid Data Received From Dual Battery Control Module
U2507	Invalid Data Received from Instrument Cluster on MOST Bus
U2508	Invalid Data Received from Audio Amplifier on MOST Bus
U2602	Battery Energy Control Module Lost Communication with Hybrid/EV Powertrain Control Module 2
U2603	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 1
U2604	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 2
U2605	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 3

Control Module U Code List (cont'd)

DTC	DTC Descriptor
U2606	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 4
U2608	Electric A/C Compressor Control Module Lost Communication with Hybrid/EV Powertrain Control Module
U2609	Battery Charger Control Module Lost Communication with Hybrid/EV Powertrain Control Module
U2611	Auxiliary Transmission Fluid Pump Control Module Lost Communication with Hybrid/EV Powertrain Control Module
U2612	Battery Charger Control Module Lost Communication with Hybrid/EV Powertrain Control Module 2
U2613	Drive Motor 1 Control Module Lost Communication with Hybrid/EV Powertrain Control Module 2
U2614	Drive Motor 2 Control Module Lost Communication with Hybrid/EV Powertrain Control Module 2
U2615	Auxiliary Transmission Fluid Pump Control Module Lost Communication with Hybrid/EV Powertrain Control Module 2
U2616	Fuel Pump Driver Control Module Lost Communication with ECM
U2617	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 5
U2618	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 6
U2619	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 7
U2620	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 8
U2621	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 9
U2622	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 10
U2623	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 11
U2624	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 12
U2625	Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 13
U3000	Control Module
U3001	Control Module Improper Shutdown Performance
U3012	Control Module Improper Wake-up Perfomance

DTC B1000

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B1000: Electronic Control Unit

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The internal fault detection is handled inside the device. The symptom byte information is for engineering reference only. No external circuit diagnosis is involved.

Conditions for Running the DTC

The device runs the program to detect an internal fault when power up is commanded. The only requirements are voltage and ground. This program runs even if the voltage is out of the valid operating range.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

The device refuses all additional inputs.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- This DTC may be stored as a history DTC without affecting the operation of the device.
- If stored only as a history DTC and not retrieved as a current DTC, do not replace the device.
- If this DTC is retrieved as both a current and history DTC, replace the device that set the DTC.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC B1000 is not set.

⇒ **If DTC B1000 is set**

Replace the device that set the DTC.

⇓ **If DTC B1000 is not set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC B1001

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B1001: Option Configuration

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

Some devices must be configured with serial numbers, vehicle options, or other information. If a device was not properly configured after installation that device may set DTC B1001. The symptom byte information is for engineering reference only. No external circuit diagnosis is involved.

Conditions for Running the DTC

Battery voltage is between 9–16 V and data link communications operate normally.

Conditions for Setting the DTC

The device is not configured properly.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold, without a repeat of the malfunction.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC B1001 is not set.

⇒ **If DTC B1001 is set**

2.1. Program the device that set the DTC.

2.2. Verify the DTC does not set.

⇒ If the DTC sets, replace the device that set the DTC.

⇓ If the DTC does not set

2.3. All OK.

⇓ **If DTC B1001 is not set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC B101D

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B101D: Electronic Control Unit Hardware

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The internal fault detection is handled inside the device. The symptom byte information is for engineering reference only. No external circuit diagnosis is involved.

Conditions for Running the DTC

- The device runs the program to detect an internal fault when power up is commanded. The only requirements are voltage and ground. This program runs even if the voltage is out of the valid operating range.
- The keyless entry control module will set this DTC with symptom byte 39 when the keyless entry control module antenna is activated.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

The device refuses all additional inputs.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- This DTC may be stored as a history DTC without affecting the operation of the device.
- Do not replace a device based only on DTC B101D being set in history with the exception of the following devices:
  - K36 Inflatable Restraint Sensing and Diagnostic Module
  - K85 Passenger Presence Module
- If DTC B101D is set as current, replace the appropriate device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC B101D is not set.

⇒ **If DTC B101D is set with symptom byte 43**

2.1. Program the device that set the DTC.

2.2. Verify the DTC does not set.

⇒ If the DTC sets, replace the device that set the DTC.

⇓ If the DTC does not set

2.3. All OK.

⇒ **If DTC B101D is set with any symptom byte, except symptom byte 43**

Replace the device that set the DTC.

⇓ **If DTC B101D is not set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC B101E

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B101E: Electronic Control Unit Software

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

Some devices must be configured with specific software, serial numbers, vehicle options, or other information. If a device was not properly configured after installation that device may set DTC B101E. The symptom byte information is for engineering reference only. No external circuit diagnosis is involved.

Conditions for Running the DTC

Battery voltage is between 9–16 V and data link communications operate normally.

Conditions for Setting the DTC

The device is not configured properly.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold, without a repeat of the malfunction.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC B101E is not set.

⇒ **If DTC B101E is set**

2.1. Program the device that set the DTC.

2.2. Verify the DTC does not set.

⇒ If the DTC sets, replace the device that set the DTC.

⇓ If the DTC does not set

2.3. All OK.

⇓ **If DTC B101E is not set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC C056D

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC C056D: Electronic Control Unit Hardware

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The internal fault detection is handled inside the device. The symptom byte information is for engineering reference only. No external circuit diagnosis is involved.

Conditions for Running the DTC

The device runs the program to detect an internal fault when power up is commanded. The only requirements are voltage and ground. This program runs even if the voltage is out of the valid operating range.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

The device refuses all additional inputs.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- This DTC may be stored as a history DTC without affecting the operation of the device.
- If stored only as a history DTC and not retrieved as a current DTC, do not replace the device.
- If this DTC is retrieved as both a current and history DTC, replace the device that set the DTC.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC C056D is not set.

⇒ **If DTC C056D is set in a device that can be programmed**

2.1. Program the device that set the DTC.

2.2. Verify the DTC does not set.

⇒ If the DTC sets, replace the device that set the DTC.

⇓ If the DTC does not set

2.3. All OK.

⇒ **If DTC C056D is set in a device that cannot be programmed**

Replace the device that set the DTC.

⇓ **If DTC C056D is not set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC C056E

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC C056E: Electronic Control Unit Software

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

Some devices must be configured with specific software, serial numbers, vehicle options, or other information. If a device was not properly configured after installation that device may set DTC C056E. The symptom byte information is for engineering reference only. No external circuit diagnosis is involved.

Conditions for Running the DTC

Battery voltage is between 9–16 V and data link communications operate normally.

Conditions for Setting the DTC

The device is not configured properly.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold, without a repeat of the malfunction.

Reference Information

Schematic Reference

Data Communication Schematics on page 11-6

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool References

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC C056E is not set.

⇒ **If DTC C056E is set**

2.1. Program the device that set the DTC.

2.2. Verify the DTC does not set.

⇒ If the DTC sets, replace the device that set the DTC.

⇓ If the DTC does not set

2.3. All OK.

⇓ **If DTC C056E is not set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P0601-P0606, P060A, P062F, or P262B

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC P0601: Control Module Read Only Memory Performance
DTC P0602: Control Module Not Programmed
DTC P0603: Control Module Long Term Memory Reset
DTC P0604: Control Module Random Access Memory Performance
DTC P0605: Control Module Programming Read Only Memory Performance
DTC P0606: Control Module Processor Performance
DTC P060A: Control Module Monitoring Processor Performance
DTC P062F: Control Module Long Term Memory Performance
DTC P262B: Control Module Power Off Timer Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

This diagnostic applies to internal microprocessor integrity conditions within the device. This diagnostic also addresses if the device is not programmed. The device monitors its ability to read and write to the memory. It also monitors a timing function. No external circuits are involved.

Conditions for Running the DTC

- Vehicle ON.
- The system voltage is greater than 9.5 V.

Conditions for Setting the DTC

The device detects an internal malfunction or incomplete programming.

Action Taken When the DTC Sets

- DTCs P0601, P0602, P0603, P0604, P0605, P0606, P060A, P062F, and P262B are Type A DTCs.
- The high voltage contactor relays may open.

Conditions for Clearing the DTC

DTCs P0601, P0602, P0603, P0604, P0605, P0606, P060A, P062F, and P262B are Type A DTCs.

Diagnostic Aids

- The DTC P0606 may set in Hybrid/EV Powertrain Control Module 2 due to other faults. Do not replace the Hybrid/EV Powertrain Control Module 2 until other DTCs are diagnosed first.
- The DTC P0606 can falsely set in Hybrid/EV Powertrain Control Module 2 when the 12 V battery has been disconnected/re-connected or if the 12 V battery has been overcharged (over 18 V). In this case, do the following. If this DTC becomes history, use scan tool to clear this DTC. No further action is required:
  - Vehicle OFF and all vehicle systems off. It may take up to 2 minutes for all vehicle systems to power down.
  - Vehicle ON, verify that DTC P0606 is in history and contactors close. (If DTC P0606 remains current and contactors do not close, repeat the above step again).
  - Use scan tool to clear the DTC to turn off the malfunction indicator lamp (MIL).
- If stored only as a history DTC and not retrieved as a current DTC, do not replace the device.

Reference Information

Schematic Reference

Data Communication Schematics on page 11-6

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-92

Scan Tool References

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note: The DTC P0606 can falsely set in K114B Hybrid/EV Powertrain Control Module 2 when disconnecting the 12 V battery. See Diagnostic Aids section for more information.

1. Vehicle in Service Mode.
2. Verify DTC P0606 is not set.

⇒ **If DTC P0606 is set with other DTCs set**

Diagnose all other DTCs first. Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇒ **If DTC P0606 is set without other DTCs set**

Replace the device that set the DTC.

⇓ **If DTC P0606 is not set**

3. Verify DTC P0602 is not set.

⇒ **If DTC P0602 is set**

3.1. Program the device that set the DTC.

3.2. Verify the DTC does not set.

⇒ If the DTC sets, replace the device that set the DTC.

⇓ If the DTC does not set

3.3. All OK.

⇓ **If DTC P0602 is not set**

4. Verify DTC P0601, P0603, P0604, P0605, P060A, P062F, or P262B is not set.

⇒ **If any of the DTCs are set**

Replace the device that set the DTC.

⇓ **If none of the DTCs are set**

5. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P06E4

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC P06E4: Control Module Wake-Up Circuit Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Accessory Wake Up Serial Data 2	P06E4, U0100-U02FF*	U0100-U02FF	P06E4, U0100-U02FF	—
* Vehicle will not start.				

Circuit/System Description

The accessory wake up serial data 2 circuit is energized by the Hybrid/EV Powertrain Control Module 2 to immediately activate other devices connected to this circuit when the Body Control Module signals the Hybrid/EV Powertrain Control Module 2 that serial data is required.

Depending on the option content, devices that may receive the wake up signal are as follows:

- Battery Charger
- Battery Energy Control Module
- Electronic Brake Control Module
- A/C Compressor
- Engine Control Module
- Power Inverter Module

Conditions for Running the DTC

- The system voltage is between 9–16 V.
- The vehicle power mode master requires serial data communication to occur.
- The Hybrid/EV Powertrain Control Module 2 attempts to wake up the devices connected to its control module output wake up circuit.
- Circuit check runs continuously.

Conditions for Setting the DTC

- The Hybrid/EV Powertrain Control Module 2 detects a fault in the control module output wake up circuit.
- A circuit fault exists for greater than 6 s.

Action Taken When the DTC Sets

- The DTC P06E4 is a type A DTC.
- The devices is never signaled; therefore the specific subsystems will not function.
- The vehicle will not start while the circuit is shorted to ground.
- The MIL will illuminate, along with several DIC messages.

Conditions for Clearing the DTC

- The DTC DTC P06E4 is a type A DTC.
- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

Short to ground will also set multiple no communication codes for high speed GMLAN devices.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-48900 HEV Safety Kit

For equivalent regional tools, refer to *Special Tools on page 9-549*.

Circuit/System Testing

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- ***Identify how to disable high voltage.***
- ***Identify how to test for the presence of high voltage.***
- ***Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.***

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedures may result in serious injury or death.

Note:

- The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.
- Use the schematic to determine which devices are on the K114B Hybrid/EV Powertrain Control Module 2 terminal 69 X2 accessory wake up serial data 2 circuit. Use the connector end view to identify the B+, ignition, and accessory wake up serial data 2 circuit terminals for each of those devices.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down. Disconnect the X2 harness connector at the K114B Hybrid/EV Powertrain Control Module 2.
2. Vehicle in Service Mode.
3. Verify a test lamp illuminates between the accessory wake up serial data circuit terminal 67 X2 and ground.

⇒ **If the test lamp does not illuminate**

3.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

3.2. Test for infinite resistance between the accessory wake up serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

3.3. Test for less than 2 Ω in the accessory wake up serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

4. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down.
5. Test for greater than 100 Ω, but less than infinite resistance, between the accessory wake up serial data 2 circuit terminal 69 X2 and ground.

⇒ **If 100 Ω or less**

Refer to Testing the Accessory Wake Up Serial Data 2 Circuits for a Short to Ground.

⇒ **If infinite resistance**

Test for an open/high resistance in the accessory wake up serial data 2 circuit.

⇓ **If greater than 100 Ω and less than infinite resistance**

6. Vehicle OFF.
7. Verify that a test lamp does not illuminate between the accessory wake up serial data 2 circuit terminal 69 X2 and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the accessory wake up serial data 2 circuit.

⇓ □ **If the test lamp does not illuminate**

8. Vehicle in Service Mode.

9. Verify that a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

9.1. Vehicle OFF.

9.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

9.1. Vehicle OFF.

9.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

10. Verify that a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

10.1. Vehicle OFF.

10.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

10.1. Vehicle OFF.

10.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

11. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Testing the Accessory Wake Up Serial Data 2 Circuits for a Short to Ground

1. Perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to *High Voltage Disabling on page 9-363*.
2. Reconnect the 12 V battery.
3. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down. Disconnect the harness connectors at an easily accessible device that shares the K114B Hybrid/EV Powertrain Control Module 2 terminal 69 X2 accessory wake up serial data 2 circuit.
4. Test for less than 100 Ω between the K114B Hybrid/EV Powertrain Control Module 2 accessory wake up serial data 2 circuit terminal 69 X2 and ground.

⇒ **If 100 Ω or greater**

Replace the device that was just disconnected.

⇓ **If less than 100 Ω**

5. Repeat step 3 until all devices on the K114B Hybrid/EV Powertrain Control Module 2 accessory wake up serial data 2 circuit terminal 69 X2 have been disconnected.
6. Repair the short to ground on the accessory wake up serial data 2 circuit.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup.

DTC P0A1F, P1A01, P1A05, or P1A06

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P0A1F: Battery Energy Control Module Performance

DTC P1A01: Battery Energy Control Module Long Term Memory Performance

DTC P1A05: Battery Energy Control Module Random Access Memory

DTC P1A06: Battery Energy Control Module Read Only Memory

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Battery Energy Control Module will diagnose its own systems and determine when a fault condition is present. Diagnostics and system status is communicated from the Battery Energy Control Module to the Hybrid Powertrain Control Module 2 through serial data. The Hybrid Powertrain Control Module 2 is the host controller for diagnostic trouble code (DTC) information.

This diagnostic applies to internal microprocessor integrity conditions within the Battery Energy Control Module. This fault is internal to the Battery Energy Control Module and no external circuits are involved.

Conditions for Running the DTC

- The Battery Energy Control Module is awake and communicating.
- The system voltage is at least 9 V.

Conditions for Setting the DTC

The Battery Energy Control Module has detected an internal malfunction.

Action Taken When the DTC Sets

- DTCs P0A1F, P1A01, P1A05, and P1A06 are type A DTCs.
- Vehicle goes to reduced battery power mode. After vehicle is turned off, vehicle will not return to propulsion active mode.

Conditions for Clearing the DTC

DTCs P0A1F, P1A01, P1A05, and P1A06 are type A DTCs.

Diagnostic Aids

If stored only as a history DTC and not retrieved as a current DTC, do not replace the device.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that DTC P0A1F, P1A01, P1A05, or P1A06 is not set.

⇒ **If any of the DTCs are set**

Replace the K16 Battery Energy Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P16B7

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC P16B7: Electric A/C Compressor Control Module Wake-Up Circuit Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Accessory Wake Up Serial Data 2	P16B7, U016B*	U016B*	U016B*	—
* Other DTCs may set with this fault				

Circuit/System Description

The accessory wake up serial data 2 circuit is energized by the K114B Hybrid/EV Powertrain Control Module 2 to immediately activate the G1 A/C Compressor connected to this circuit when the body control module signals the K114B Hybrid/EV Powertrain Control Module 2 that serial data is required.

Conditions for Running the DTC

- The system voltage is greater than 10.25 V.
- The G1 A/C Compressor is awake.
- Vehicle ON.
- The G1 A/C Compressor receives serial data message from K114B Hybrid/EV Powertrain Control Module 2 and "Propulsion System Active" is TRUE for 500 ms continuously.

Conditions for Setting the DTC

The G1 A/C Compressor detects a fault in the wake up circuit.

Action Taken When the DTC Sets

DTC P16B7 is a type B DTC.

Conditions for Clearing the DTC

DTC P16B7 is a type B DTC.

Diagnostic Aids

Short to ground may set multiple no communication codes for high speed GMLAN devices.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC P06E4 is not set.

⇒ **If DTC P06E4 is set**

Refer to *DTC P06E4 on page 11-35*.

⇓ **If DTC P06E4 is not set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's accessory wake up serial data 2 circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the X1 harness connector at the G1 A/C Compressor. It may take up to 2 min for all vehicle systems to power down.
2. Vehicle in Service Mode.
3. Verify that a test lamp illuminates between the accessory wake up serial data 2 circuit terminal 2 X1 and ground.

⇒ **If the test lamp does not illuminate**

3.1. Vehicle OFF and all vehicle systems OFF, remove the test lamp, disconnect the X2 harness connector at the K114B Hybrid/EV Powertrain Control Module 2.

3.2. Test for less than 2 Ω between the G1 A/C Compressor wake up circuit terminal 2 X1 and the K114B Hybrid/EV Powertrain Control Module 2 wake up circuit terminal 69 X2.

⇒ If 2 Ω or greater, repair the open/high resistance in the accessory wake up serial data 2 circuit.

⇓ If less than 2 Ω

3.3. Vehicle in Service Mode.

3.4. Verify that a test lamp illuminates between the K114B Hybrid/EV Powertrain Control Module 2 accessory wake up serial data circuit terminal 67 X2 and ground.

⇒ If the test lamp does not illuminate, test the accessory wake up serial data circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K9 Body Control Module.

⇓ If the test lamp illuminates

3.5. Replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

4. Test or replace the G1 A/C Compressor.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P16B8-P16BA

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P16B8: Electric A/C Compressor Control Module Random Access Memory Performance

DTC P16B9: Electric A/C Compressor Control Module Read Only Memory Performance

DTC P16BA: Electric A/C Compressor Control Module Long Term Memory Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The A/C Compressor will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the A/C compressor. This fault is internal to the A/C compressor and no external circuits are involved.

Conditions for Running the DTC

- System voltage is greater than 10.25 V.
- The device is awake and communicating.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P16B8, P16B9, and P16BA are type A DTCs.

Conditions for Clearing the DTC

- DTCs P16B8, P16B9, and P16BA are type A DTCs.
- After the vehicle has been OFF for a sufficient amount of time to allow the devices to enter a sleep mode, the devices will re-enable the output on the following ignition cycle and the DTC will become history.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC P16B8, P16B9, or P16BA is not set.

⇒ **If any of the DTCs are set**

Replace the G1 A/C Compressor.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P16C1-P16C5

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P16C1: Battery Charger Control Module Read Only Memory Performance
DTC P16C2: Battery Charger Control Module Random Access Memory Performance
DTC P16C3: Battery Charger Control Module Long Term Memory Performance
DTC P16C4: Battery Charger Control Module Serial Peripheral Interface (SPI) Bus 1
DTC P16C5: Battery Charger Control Module Serial Peripheral Interface (SPI) Bus 2

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Battery Charger will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Battery Charger. This fault is internal to the Battery Charger and no external circuits are involved.

Conditions for Running the DTC

- The device is awake and communicating.
- The vehicle is in charge mode.
- Charge mode is not in heat only mode.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

- DTCs P16C1, P16C2, P16C3, and P16C5 are Type A DTCs.
- DTC P16C4 is a Type A or B DTC depending on Hybrid/EV Powertrain Control Module 2 calibration.

Conditions for Clearing the DTC

- DTCs P16C1, P16C2, P16C3, and P16C5 are Type A DTCs.
- DTC P16C4 is a Type A or B DTC depending on Hybrid/EV Powertrain Control Module 2 calibration.

Diagnostic Aids

- The DTC may be stored as a history DTC without affecting the operation of the device.
- If stored only as a history DTC and not retrieved as a current DTC, do not replace the device.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC P16C1, P16C2, P16C3, P16C4, or P16C5 is not set.

⇒ **If any of the DTCs are set**

2.1. Program the T18 Battery Charger.

2.2. Verify the DTC does not set.

⇒ If the DTC sets, replace the T18 Battery Charger.

⇓ If the DTC does not set

2.3. All OK.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P16C6

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC P16C6: Battery Charger Control Module Wake-Up Circuit Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Accessory Wake Up Serial Data 2	P16C6, U0100-U02FF*	U0100-U02FF	U0100-U02FF	—
* Other DTCs may set with this fault				

Circuit/System Description

The accessory wake up serial data 2 circuit is energized by the K114B Hybrid/EV Powertrain Control Module 2 to immediately activate the T18 Battery Charger connected to this circuit when the K9 Body Control Module signals the K114B Hybrid/EV Powertrain Control Module 2 that serial data is required. The T18 Battery Charger monitors the accessory wake up serial data 2 circuit along with the propulsion system active status serial data message. The propulsion system active status message should not be active when the accessory wake up serial data 2 circuit is not high. This DTC is set when the accessory wake up serial data 2 circuit is not high when the propulsion system active signal status is active.

Conditions for Running the DTC

DTC U2609 is not set.

Conditions for Setting the DTC

The T18 Battery Charger detects a fault in the wake up circuit.

Action Taken When the DTC Sets

DTC P16C6 is a type A DTC.

Conditions for Clearing the DTC

DTC P16C6 is a type A DTC.

Diagnostic Aids

A short to ground may set multiple no communication codes for high speed GMLAN devices.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC P06E4 is not set.

⇒ **If DTC P06E4 is set**

Refer to *DTC P06E4 on page 11-35*.

⇓ **If DTC P06E4 is not set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's accessory wake up serial data 2 circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down. Disconnect the X1 harness connector at the T18 Battery Charger.
2. Vehicle in Service Mode.
3. Verify that a test lamp illuminates between the accessory wake up serial data 2 circuit terminal F X1 and ground.

⇒ **If the test lamp does not illuminate**

3.1. Vehicle OFF and all vehicle systems OFF, remove the test lamp, disconnect the X2 harness connector at the K114B Hybrid/EV Powertrain Control Module 2.

3.2. Test for less than 2 Ω between the T18 Battery Charger wake up circuit terminal F X1 and the K114B Hybrid/EV Powertrain Control Module 2 wake up circuit terminal 69 X2.

⇒ If 2 Ω or greater, repair the open/high resistance in the accessory wake up serial data 2 circuit.

⇓ If less than 2 Ω

3.3. Vehicle in Service Mode.

3.4. Verify that a test lamp illuminates between the K114B Hybrid/EV Powertrain Control Module 2 accessory wake up serial data circuit terminal 67 X2 and ground.

⇒ If the test lamp does not illuminate, test the accessory wake up serial data circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K9 Body Control Module.

⇓ If the test lamp illuminates

3.5. Replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

4. Test or replace the T18 Battery Charger.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup.

DTC P1E8E-P1E91 or P1F06

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1E8E: Hybrid/EV Battery Interface Control Module 1 Performance
DTC P1E8F: Hybrid/EV Battery Interface Control Module 1 Random Access Memory Performance
DTC P1E90: Hybrid/EV Battery Interface Control Module 1 Read Only Memory Performance
DTC P1E91: Hybrid/EV Battery Interface Control Module 1 Long Term Memory Performance
DTC P1F06: Hybrid/EV Battery Interface Control Module 1 Processor Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Hybrid/EV Battery Interface Control Module 1 will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Hybrid/EV Battery Interface Control Module 1. This fault is internal to the Hybrid/EV Battery Interface Control Module 1 and no external circuits are involved.

Conditions for Running the DTC

- The device is awake.
- The system voltage is at least 9 V.
- DTC U2603 is not set.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P1E8E, P1E8F, P1E90 P1E91, and P1F06 are type A DTCs.

Conditions for Clearing the DTC

DTCs P1E8E, P1E8F, P1E90 P1E91, and P1F06 are type A DTCs.

Diagnostic Aids

- If stored only as a history DTC and not retrieved as a current DTC, do not replace the Hybrid/EV Battery Interface Control Modules 1.
- The Hybrid/EV Battery Interface Control Modules 1–10 are all internal to the Battery Energy Control Module.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that DTC P1E8E, P1E8F, P1E90 P1E91, or P1F06 is not set.

⇒ **If any of the DTCs are set**

Replace the K16 Battery Energy Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P1E94-P1E97 or P1F07

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1E94: Hybrid/EV Battery Interface Control Module 2 Performance
DTC P1E95: Hybrid/EV Battery Interface Control Module 2 Random Access Memory Performance
DTC P1E96: Hybrid/EV Battery Interface Control Module 2 Read Only Memory Performance
DTC P1E97: Hybrid/EV Battery Interface Control Module 2 Long Term Memory Performance
DTC P1F07: Hybrid/EV Battery Interface Control Module 2 Processor Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Hybrid/EV Battery Interface Control Module 2 will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Hybrid/EV Battery Interface Control Module 2. This fault is internal to the Hybrid/EV Battery Interface Control Module 2 and no external circuits are involved.

Conditions for Running the DTC

- The device is awake.
- The system voltage is at least 9 V.
- DTC U2604 is not set.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P1E94, P1E95, P1E96, P1E97, and P1F07 are type A DTCs.

Conditions for Clearing the DTC

DTCs P1E94, P1E95, P1E96, P1E97, and P1F07 are type A DTCs.

Diagnostic Aids

- If stored only as a history DTC and not retrieved as a current DTC, do not replace the Hybrid/EV Battery Interface Control Modules 2.
- The Hybrid/EV Battery Interface Control Modules 1–10 are all internal to the Battery Energy Control Module.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that DTC P1E94, P1E95, P1E96, P1E97, or P1F07 is not set.

⇒ **If any of the DTCs are set**

Replace the K16 Battery Energy Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P1E9A-P1E9D or P1F08

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1E9A: Hybrid/EV Battery Interface Control Module 3 Performance
DTC P1E9B: Hybrid/EV Battery Interface Control Module 3 Random Access Memory Performance
DTC P1E9C: Hybrid/EV Battery Interface Control Module 3 Read Only Memory Performance
DTC P1E9D: Hybrid/EV Battery Interface Control Module 3 Long Term Memory Performance
DTC P1F08: Hybrid/EV Battery Interface Control Module 3 Processor Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Hybrid/EV Battery Interface Control Module 3 will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Hybrid/EV Battery Interface Control Module 3. This fault is internal to the Hybrid/EV Battery Interface Control Module 3 and no external circuits are involved.

Conditions for Running the DTC

- The device is awake.
- The system voltage is at least 9 V.
- DTC U2605 is not set.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P1E9A, P1E9B, P1E9C, P1E9D, and P1F08 are type A DTCs.

Conditions for Clearing the DTC

DTCs P1E9A, P1E9B, P1E9C, P1E9D, and P1F08 are type A DTCs.

Diagnostic Aids

- If stored only as a history DTC and not retrieved as a current DTC, do not replace the Hybrid/EV Battery Interface Control Modules 3.
- The Hybrid/EV Battery Interface Control Modules 1–10 are all internal to the Battery Energy Control Module.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that DTC P1E9A, P1E9B, P1E9C, P1E9D, or P1F08 is not set.

⇒ **If any of the DTCs are set**

Replace the K16 Battery Energy Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P1EA0-P1EA3 or P1F09

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1EA0: Hybrid/EV Battery Interface Control Module 4 Performance
DTC P1EA1: Hybrid/EV Battery Interface Control Module 4 Random Access Memory Performance
DTC P1EA2: Hybrid/EV Battery Interface Control Module 4 Read Only Memory Performance
DTC P1EA3: Hybrid/EV Battery Interface Control Module 4 Long Term Memory Performance
DTC P1F09: Hybrid/EV Battery Interface Control Module 4 Processor Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Hybrid/EV Battery Interface Control Module 4 will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Hybrid/EV Battery Interface Control Module 4. This fault is internal to the Hybrid/EV Battery Interface Control Module 4 and no external circuits are involved.

Conditions for Running the DTC

- The device is awake.
- The system voltage is at least 9 V.
- DTC U2606 is not set.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P1EA0, P1EA1, P1EA2, P1EA3, and P1F09 are type A DTCs.

Conditions for Clearing the DTC

DTCs P1EA0, P1EA1, P1EA2, P1EA3, and P1F09 are type A DTCs.

Diagnostic Aids

- If stored only as a history DTC and not retrieved as a current DTC, do not replace the Hybrid/EV Battery Interface Control Modules 4.
- The Hybrid/EV Battery Interface Control Modules 1–10 are all internal to the Battery Energy Control Module.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that DTC P1EA0, P1EA1, P1EA2, P1EA3, or P1F09 is not set.

⇒ **If any of the DTCs are set**

Replace the K16 Battery Energy Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P1EB1

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC P1EB1: Hybrid/EV Battery Interface Control Module Software Incompatible

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

This is the software incompatibility issue between the Hybrid/EV Battery Interface Control Modules and the Battery Energy Control Module. No external circuits are involved.

Conditions for Running the DTC

- Vehicle ON.
- The system voltage is at least 9 V.
- DTC U2603, U2604, U2605, U2606, U2617, U2618, U2619, U2620, U2621, U2622, U2623, or U2624 is not set.

Conditions for Setting the DTC

- Any one of the Hybrid/EV Battery Interface Control Module software revision does not match.
- Battery Energy Control Module software and Hybrid/EV Battery Interface Control Module software are incompatible.

Action Taken When the DTC Sets

DTC P1EB1 is a type A DTC.

Conditions for Clearing the DTC

DTC P1EB1 is a type A DTC.

Diagnostic Aids

If stored only as a history DTC and not retrieved as a current DTC, do not replace the device.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify DTC P1EB1 is not set.

⇒ **If DTC P1EB1 is set**

2.1. Program the K16 Battery Energy Control Module.

2.2. Verify the DTC does not set.

⇒ If the DTC sets without other DTCs set, replace the K16 Battery Energy Control Module.

⇒ If the DTC sets along with any of the DTCs P1EB2, P1EB3, P1EB4, P1EB5, P1FA6, P1FA7, P1FA8, P1FA9, P1FAA, P1FAB, P3030, or P303B set, refer to *DTC P1EB2-P1EB5, P1FA6-P1FAB, P3030, or P303B on page 11-50*.

⇓ If the DTC does not set

2.3. All OK.

⇓ **If DTC P1EB1 is not set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P1EB2-P1EB5, P1FA6-P1FAB, P3030, or P303B

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1EB2: Hybrid/EV Battery Interface Control Module 1 Not Programmed
DTC P1EB3: Hybrid/EV Battery Interface Control Module 2 Not Programmed
DTC P1EB4: Hybrid/EV Battery Interface Control Module 3 Not Programmed
DTC P1EB5: Hybrid/EV Battery Interface Control Module 4 Not Programmed
DTC P1FA6: Hybrid/EV Battery Interface Control Module 5 Not Programmed
DTC P1FA7: Hybrid/EV Battery Interface Control Module 6 Not Programmed
DTC P1FA8: Hybrid/EV Battery Interface Control Module 7 Not Programmed
DTC P1FA9: Hybrid/EV Battery Interface Control Module 8 Not Programmed
DTC P1FAA: Hybrid/EV Battery Interface Control Module 9 Not Programmed
DTC P1FAB: Hybrid/EV Battery Interface Control Module 10 Not Programmed
DTC P3030: Hybrid/EV Battery Interface Control Module 11 Not Programmed
DTC P303B: Hybrid/EV Battery Interface Control Module 12 Not Programmed

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

When the Battery Energy Control Module is flash programmed, the Hybrid/EV Battery Interface Control Module operating software and calibrations are provided to the Battery Energy Control Module. The Hybrid/EV Battery Interface Control Module software and calibrations are then loaded to each of the Hybrid/EV Battery Interface Control Modules from the Battery Energy Control Module. This operation is automatic and requires no operator action. At this point, if any of the Hybrid/EV Battery Interface Control Modules are not programmed correctly, the appropriate DTC is set.

This fault is internal to the Hybrid/EV Battery Interface Control Modules and no external circuits are involved.

Conditions for Running the DTC

- The Battery Energy Control Module is awake and communicating.
- The system voltage is at least 9 V.

Conditions for Setting the DTC

The Hybrid/EV Battery Interface Control Module is not programmed correctly.

Action Taken When the DTC Sets

DTCs P1EB2, P1EB3, P1EB4, P1EB5, P1FA6, P1FA7, P1FA8, P1FA9, P1FAA, P1FAB, P3030, and P303B are type A DTCs.

Conditions for Clearing the DTC

- The Hybrid/EV Battery Interface Control Module is programmed correctly.
- DTCs P1EB2, P1EB3, P1EB4, P1EB5, P1FA6, P1FA7, P1FA8, P1FA9, P1FAA, P1FAB, P3030, and P303B are type A DTCs.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify DTC P1EB2, P1EB3, P1EB4, P1EB5, P1FA6, P1FA7, P1FA8, P1FA9, P1FAA, P1FAB, P3030, or P303B is not set.

⇒ **If any of the DTCs are set**

2.1. Program the K16 Battery Energy Control Module.

2.2. Verify the DTC does not set.

⇒ If the DTC P1EB2 sets, replace the K16 Battery Energy Control Module.

⇒ If the DTC P1EB3 sets, replace the K16 Battery Energy Control Module.

⇒ If the DTC P1EB4 sets, replace the K16 Battery Energy Control Module.

⇒ If the DTC P1EB5 sets, replace the K16 Battery Energy Control Module.

⇒ If the DTC P1FA6 sets, replace the K16 Battery Energy Control Module.

⇒ If the DTC P1FA7 sets, replace the K16 Battery Energy Control Module.

⇒ If the DTC P1FA8 sets, replace the K16 Battery Energy Control Module.

⇒ If the DTC P1FA9 sets, replace the K16 Battery Energy Control Module.

⇒ If the DTC P1FAA sets, replace the K16 Battery Energy Control Module.

⇒ If the DTC P1FAB sets, replace the K16 Battery Energy Control Module.

⇒ If the DTC P3030 sets, replace the K112 Hybrid/EV Battery Interface Control Module.

⇒ If the DTC P303B sets, replace the K112 Hybrid/EV Battery Interface Control Module.

⇓ If the DTC does not set

2.3. All OK.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P1EB9

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC P1EB9: High Voltage Energy Management Communication Bus Enable Circuit

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
High Voltage Energy Management Communication Enable	P1EB9, U0100-U02FF*	U0100-U02FF	P1EB9, U0100-U02FF	—
* Vehicle will not start.				

Circuit/System Description

The Hybrid Powertrain Control Module 2 activates the high voltage energy management communication enable circuit when the vehicle is on. This circuit wakes up the devices for high voltage energy bus communication.

Conditions for Running the DTC

- The system voltage is between 9–16 V.
- The vehicle power mode master requires serial data communication to occur.

Conditions for Setting the DTC

The Hybrid Powertrain Control Module 2 detects a fault in the high voltage energy management communication enable circuit.

Action Taken When the DTC Sets

DTC P1EB9 is a type A DTC.

Conditions for Clearing the DTC

DTC P1EB9 is a type A DTC.

Diagnostic Aids

- A short to ground on the high voltage energy management communication enable circuit will set multiple no communication codes for devices on high voltage energy management serial data bus.
- When the high voltage energy management communication enable circuit is shorted to voltage, DTC P1EB9 may set as Pass and Fail during the time the vehicle is in service mode. Continue to monitor this DTC when the vehicle is off. This DTC will change its status to Current when the vehicle goes into the sleep mode.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-48900 HEV Safety Kit

For equivalent regional tools, refer to *Special Tools on page 9-549*.

Circuit/System Testing

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- ***Identify how to disable high voltage.***
- ***Identify how to test for the presence of high voltage.***
- ***Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.***

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedures may result in serious injury or death.

Note:

- The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.
- Use the schematics to determine which devices are on the K114B Hybrid/EV Powertrain Control Module 2 terminal 48 X2 high voltage energy management communication enable circuit. Use the connector end views to identify the B+, ignition, and high voltage energy management communication enable circuit terminals for each of those devices.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the X2 harness connector at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 min for all vehicle systems to power down.
2. Test for greater than 100 Ω, but less than infinite resistance, between the high voltage energy management communication enable circuit terminal 48 X2 and ground.

⇒ **If 100 Ω or less**

Refer to Testing the High Voltage Energy Management Communication Enable Circuits for a Short to Ground.

⇒ **If infinite resistance**

Test for an open/high resistance in the high voltage energy management communication enable circuit.

⇓ **If greater than 100 Ω and less than infinite resistance**

3. Vehicle OFF.
4. Verify that a test lamp does not illuminate between the high voltage energy management communication enable circuit terminal 48 X2 and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the high voltage energy management communication enable circuit.

⇓ □ **If the test lamp does not illuminate**

5. Vehicle in Service Mode.
6. Verify that a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. Verify that a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

8.1. Vehicle OFF.

8.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

8.1. Vehicle OFF.

8.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Testing the High Voltage Energy Management Communication Enable Circuits for a Short to Ground

1. Perform the High Voltage Disabling procedure. Refer to *High Voltage Disabling on page 9-363*.
2. Reconnect the 12 V battery.
3. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connector at an easily accessible device that shares the K114B Hybrid/EV Powertrain Control Module 2 terminal 48 X2 high voltage energy management communication enable circuit. It may take up to 2 min for all vehicle systems to power down.
4. Test for less than 100 Ω between the K114B Hybrid/EV Powertrain Control Module 2 high voltage energy management communication enable circuit terminal 48 X2 and ground.

⇒ **If 100 Ω or greater**

Replace the device that was just disconnected.

⇓ **If less than 100 Ω**

5. Repeat step 3 until all devices on the K114B Hybrid/EV Powertrain Control Module 2 high voltage energy management communication enable circuit terminal 48 X2 have been disconnected.
6. Repair the short to ground on the high voltage energy management communication enable circuit.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup.

DTC P1EC1 or P1EC2

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1EC1: Battery Energy Control Module High Voltage Energy Management Communication Bus Enable Circuit Low Voltage

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
High Voltage Energy Management Communication Enable	P1EC1	P1EC1	—	—

Circuit/System Description

The Hybrid/EV Powertrain Control Module 2 activates the high voltage energy management communication enable circuit when the vehicle is on. The high voltage energy management communication enable circuit wakes up the Battery Energy Control Module for serial data communication.

The Battery Energy Control Module compares the high voltage energy management communication enable hardwire signal with a Hybrid/EV Powertrain Control Module 2 serial data message indicating that the high voltage energy management communication enable signal is active. If the high voltage energy management communication enable hardwire signal is low when the serial data message indicates it should be high, then DTC P1EC1 is set.

Conditions for Running the DTC

- The device is awake and communicating.
- The system voltage is at least 9 V.
- DTCs U2602, U180B, P1A0C, or P1A07 is not set.

Conditions for Setting the DTC

P1EC1

The ignition voltage on the high voltage energy management communication enable circuit is less than 5 V.

Action Taken When the DTC Sets

DTCs P1EC1 and P1EC2 are type A DTCs.

Conditions for Clearing the DTC

P1EC1

The ignition voltage on the high voltage energy management communication enable circuit is at least 5 V for 10 s.

DTCs P1EC1 and P1EC2 are type A DTCs.

Diagnostic Aids

Short to ground will also set multiple no communication codes for devices on high voltage management serial data bus.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

- *EL-48900* HEV Safety Kit
- *EL-51099* Low Voltage Jumper Harness Extension

For equivalent regional tools, refer to *Special Tools on page 9-549*.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC P1EB9 or U185B is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- ***Identify how to disable high voltage.***
- ***Identify how to test for the presence of high voltage.***
- ***Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.***

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedures may result in serious injury or death.

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

Note: Use the schematics and connector end views to identify the devices' high voltage energy management communication enable circuit terminals.

1. Vehicle OFF, disconnect the X357 harness connector at the A4 Hybrid/EV Battery Pack.
2. Vehicle in Service Mode.
3. Verify that a test lamp illuminates between the high voltage energy management communication enable circuit terminal 14 X357 and ground.

⇒ **If the test lamp does not illuminate**

3.1. Vehicle OFF, disconnect the X2 harness connector at the K114B Hybrid/EV Powertrain Control Module 2.

3.2. Test for less than 2 Ω in the high voltage energy management communication enable circuit end to end between the A4 Hybrid/EV Battery Pack terminal 14 X357 and the K114B Hybrid/EV Powertrain Control Module 2 terminal 48 X2.

⇒ If greater than 2 Ω, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

4. Vehicle OFF, connect the X357 harness connector at the A4 Hybrid/EV Battery Pack.
5. Perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to *High Voltage Disabling on page 9-363*.
6. Reconnect the 12 V battery.
7. Vehicle OFF, connect EL-51099 low voltage jumper harness extension.
8. Disconnect the harness connector at the K16 Battery Energy Control Module.
9. Vehicle in Service Mode.
10. Verify that a test lamp illuminates between the high voltage energy management communication enable circuit terminal 27 at K16 Battery Energy Control Module and ground.

⇒ **If the test lamp does not illuminate**

Repair the open/high resistance in the circuit.

⇓ **If the test lamp illuminates**

11. Replace the K16 Battery Energy Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC P1EF8

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1EF8: Battery Charger Control Module High Voltage Energy Management Communication Bus Enable Circuit Low Voltage

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
High Voltage Energy Management Communication Enable	P1EF8, P1EB9	P1EF8	—	—

Circuit/System Description

The Battery Charger compares the high voltage energy management communication enable hardwire signal with a Hybrid/EV Powertrain Control Module 2 serial data message indicating that the high voltage energy management communication enable signal is active. If the high voltage energy management communication enable hardwire signal is low when the serial data message indicates it should be high, then DTC P1EF8 is set.

Conditions for Running the DTC

The device is awake and communicating.

Conditions for Setting the DTC

A short to ground or an open circuit may exist on the high voltage energy communication enable circuit.

Action Taken When the DTC Sets

DTC P1EF8 is a type A DTCs.

Conditions for Clearing the DTC

DTC P1EF8 is a type A DTCs.

Diagnostic Aids

A short to ground will also set multiple no communication codes for devices on high voltage energy serial data bus.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC P1EB9 is not set.

⇒ **If DTC P1EB9 is set**

Refer to *DTC P1EB9 on page 11-52*.

⇓ **If DTC P1EB9 is not set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the devices' high voltage energy management communication enable circuit terminals.

1. Vehicle OFF, disconnect the X1 harness connector at the T18 Battery Charger.
2. Vehicle in Service Mode.

3. Verify that a test lamp illuminates between the high voltage energy management communication enable circuit terminal G X1 and ground.

⇒ **If the test lamp does not illuminate**

3.1. Vehicle OFF, disconnect the X2 harness connector at the K114B Hybrid/EV Powertrain Control Module 2.

3.2. Test for less than 2 Ω in the high voltage energy management communication enable circuit end to end between the T18 Battery Charger terminal G X1 and the K114B Hybrid/EV Powertrain Control Module 2 terminal 48 X2.

⇒ If greater than 2 Ω, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

4. Replace the T18 Battery Charger.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P1FAC, P1FB1, P1FB7, P1FBD, or P1FCF

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1FAC: Hybrid/EV Battery Interface Control Module 5 Read Only Memory Performance

DTC P1FB1: Hybrid/EV Battery Interface Control Module 5 Random Access Memory Performance

DTC P1FB7: Hybrid/EV Battery Interface Control Module 5 Long Term Memory Performance

DTC P1FBD: Hybrid/EV Battery Interface Control Module 5 Performance

DTC P1FCF: Hybrid/EV Battery Interface Control Module 5 Processor Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Hybrid/EV Battery Interface Control Module 5 will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Hybrid/EV Battery Interface Control Module 5. This fault is internal to the Hybrid/EV Battery Interface Control Module 5 and no external circuits are involved.

Conditions for Running the DTC

- The device is awake.
- The system voltage is at least 9 V.
- DTC U2617 is not set.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P1FAC, P1FB1, P1FB7, P1FBD, and P1FCF are type A DTCs.

Conditions for Clearing the DTC

DTCs P1FAC, P1FB1, P1FB7, P1FBD, and P1FCF are type A DTCs.

Diagnostic Aids

- If stored only as a history DTC and not retrieved as a current DTC, do not replace the Hybrid/EV Battery Interface Control Modules 5.
- The Hybrid/EV Battery Interface Control Modules 1–10 are all internal to the Battery Energy Control Module.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that DTC P1FAC, P1FB1, P1FB7, P1FBD, or P1FCF is not set.

⇒ **If any of the DTCs are set**

Replace the K16 Battery Energy Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P1FAD, P1FB3, P1FB9, P1FBF, or P1FD1

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1FAD: Hybrid/EV Battery Interface Control Module 7 Read Only Memory Performance
DTC P1FB3: Hybrid/EV Battery Interface Control Module 7 Random Access Memory Performance
DTC P1FB9: Hybrid/EV Battery Interface Control Module 7 Long Term Memory Performance
DTC P1FBF: Hybrid/EV Battery Interface Control Module 7 Performance
DTC P1FD1: Hybrid/EV Battery Interface Control Module 7 Processor Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Hybrid/EV Battery Interface Control Module 7 will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Hybrid/EV Battery Interface Control Module 7. This fault is internal to the Hybrid/EV Battery Interface Control Module 7 and no external circuits are involved.

Conditions for Running the DTC

- The device is awake.
- The system voltage is at least 9 V.
- DTC U2619 is not set.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P1FAD, P1FB3, P1FB9, P1FBF, and P1FD1 are type A DTCs.

Conditions for Clearing the DTC

DTCs P1FAD, P1FB3, P1FB9, P1FBF, and P1FD1 are type A DTCs.

Diagnostic Aids

- If stored only as a history DTC and not retrieved as a current DTC, do not replace the Hybrid/EV Battery Interface Control Modules 7.
- The Hybrid/EV Battery Interface Control Modules 1–10 are all internal to the Battery Energy Control Module.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that DTC P1FAD, P1FB3, P1FB9, P1FBF, or P1FD1 is not set.

⇒ **If any of the DTCs are set**

Replace the K16 Battery Energy Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P1FAE, P1FB4, P1FBA, P1FC0, or P1FD2

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1FAE: Hybrid/EV Battery Interface Control Module 8 Read Only Memory Performance
DTC P1FB4: Hybrid/EV Battery Interface Control Module 8 Random Access Memory Performance
DTC P1FBA: Hybrid/EV Battery Interface Control Module 8 Long Term Memory Performance
DTC P1FC0: Hybrid/EV Battery Interface Control Module 8 Performance
DTC P1FD2: Hybrid/EV Battery Interface Control Module 8 Processor Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Hybrid/EV Battery Interface Control Module 8 will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Hybrid/EV Battery Interface Control Module 8. This fault is internal to the Hybrid/EV Battery Interface Control Module 8 and no external circuits are involved.

Conditions for Running the DTC

- The device is awake.
- The system voltage is at least 9 V.
- DTC U2620 is not set.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P1FAE, P1FB4, P1FBA, P1FC0, and P1FD2 are type A DTCs.

Conditions for Clearing the DTC

DTCs P1FAE, P1FB4, P1FBA, P1FC0, and P1FD2 are type A DTCs.

Diagnostic Aids

- If stored only as a history DTC and not retrieved as a current DTC, do not replace the Hybrid/EV Battery Interface Control Modules 8.
- The Hybrid/EV Battery Interface Control Modules 1–10 are all internal to the Battery Energy Control Module.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that DTC P1FAE, P1FB4, P1FBA, P1FC0, or P1FD2 is not set.

⇒ **If any of the DTCs are set**

Replace the K16 Battery Energy Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P1FAF, P1FB5, P1FBB, P1FC1, or P1FD3

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1FAF: Hybrid/EV Battery Interface Control Module 9 Read Only Memory Performance
DTC P1FB5: Hybrid/EV Battery Interface Control Module 9 Random Access Memory Performance
DTC P1FBB: Hybrid/EV Battery Interface Control Module 9 Long Term Memory Performance
DTC P1FC1: Hybrid/EV Battery Interface Control Module 9 Performance
DTC P1FD3: Hybrid/EV Battery Interface Control Module 9 Processor Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Hybrid/EV Battery Interface Control Module 9 will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Hybrid/EV Battery Interface Control Module 9. This fault is internal to the Hybrid/EV Battery Interface Control Module 9 and no external circuits are involved.

Conditions for Running the DTC

- The device is awake.
- The system voltage is at least 9 V.
- DTC U2621 is not set.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P1FAF, P1FB5, P1FBB, P1FC1, and P1FD3 are type A DTCs.

Conditions for Clearing the DTC

DTCs P1FAF, P1FB5, P1FBB, P1FC1, and P1FD3 are type A DTCs.

Diagnostic Aids

- If stored only as a history DTC and not retrieved as a current DTC, do not replace the Hybrid/EV Battery Interface Control Modules 9.
- The Hybrid/EV Battery Interface Control Modules 1–10 are all internal to the Battery Energy Control Module.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that P1FAF, P1FB5, P1FBB, P1FC1, or P1FD3 is not set.

⇒ **If any of the DTCs are set**

Replace the K16 Battery Energy Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P1FB0, P1FB6, P1FBC, P1FC2, or P1FD4

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1FB0: Hybrid/EV Battery Interface Control Module 10 Read Only Memory Performance
DTC P1FB6: Hybrid/EV Battery Interface Control Module 10 Random Access Memory Performance
DTC P1FBC: Hybrid/EV Battery Interface Control Module 10 Long Term Memory Performance
DTC P1FC2: Hybrid/EV Battery Interface Control Module 10 Performance
DTC P1FD4: Hybrid/EV Battery Interface Control Module 10 Processor Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Hybrid/EV Battery Interface Control Module 10 will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Hybrid/EV Battery Interface Control Module 10. This fault is internal to the Hybrid/EV Battery Interface Control Module 10 and no external circuits are involved.

Conditions for Running the DTC

- The device is awake.
- The system voltage is at least 9 V.
- DTC U2622 is not set.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P1FB0, P1FB6, P1FBC, P1FC2, and P1FD4 are type A DTCs.

Conditions for Clearing the DTC

DTCs P1FB0, P1FB6, P1FBC, P1FC2, and P1FD4 are type A DTCs.

Diagnostic Aids

- If stored only as a history DTC and not retrieved as a current DTC, do not replace the Hybrid/EV Battery Interface Control Modules 10.
- The Hybrid/EV Battery Interface Control Modules 1–10 are all internal to the Battery Energy Control Module.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that P1FB0, P1FB6, P1FBC, P1FC2, or P1FD4 is not set.

⇒ **If any of the DTCs are set**

Replace the K16 Battery Energy Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P1FB2, P1FB8, P1FBE, P1FD0, or P1FF3

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1FB2: Hybrid/EV Battery Interface Control Module 6 Random Access Memory Performance
DTC P1FB8: Hybrid/EV Battery Interface Control Module 6 Long Term Memory Performance
DTC P1FBE: Hybrid/EV Battery Interface Control Module 6 Performance
DTC P1FD0: Hybrid/EV Battery Interface Control Module 6 Processor Performance
DTC P1FF3: Hybrid/EV Battery Interface Control Module 6 Read Only Memory Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Hybrid/EV Battery Interface Control Module 6 will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Hybrid/EV Battery Interface Control Module 6. This fault is internal to the Hybrid/EV Battery Interface Control Module 6 and no external circuits are involved.

Conditions for Running the DTC

- The device is awake.
- The system voltage is at least 9 V.
- DTC U2618 is not set.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P1FB2, P1FB8, P1FBE, P1FD0, and P1FF3 are type A DTCs.

Conditions for Clearing the DTC

DTCs P1FB2, P1FB8, P1FBE, P1FD0, and P1FF3 are type A DTCs.

Diagnostic Aids

- If stored only as a history DTC and not retrieved as a current DTC, do not replace the Hybrid/EV Battery Interface Control Modules 6.
- The Hybrid/EV Battery Interface Control Modules 1–10 are all internal to the Battery Energy Control Module.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that P1FB2, P1FB8, P1FBE, P1FD0, or P1FF3 is not set.

⇒ **If any of the DTCs are set**

Replace the K16 Battery Energy Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P3031-P3034 or P3037

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P3031: Hybrid/EV Battery Interface Control Module 11 Read Only Memory
DTC P3032: Hybrid/EV Battery Interface Control Module 11 Random Access Memory
DTC P3033: Hybrid/EV Battery Interface Control Module 11 Long Term Memory Performance
DTC P3034: Hybrid/EV Battery Interface Control Module 11 Performance
DTC P3037: Hybrid/EV Battery Interface Control Module 11 Processor Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Hybrid/EV Battery Interface Control Module 11 will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Hybrid/EV Battery Interface Control Module 11. This fault is internal to the Hybrid/EV Battery Interface Control Module 11 and no external circuits are involved.

Conditions for Running the DTC

- The device is awake.
- The system voltage is at least 9 V.
- DTC U2623 is not set.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P3031, P3032, P3033, P3034, and P3037 are type A DTCs.

Conditions for Clearing the DTC

DTCs P3031, P3032, P3033, P3034, and P3037 are type A DTCs.

Diagnostic Aids

- If stored only as a history DTC and not retrieved as a current DTC, do not replace the Hybrid/EV Battery Interface Control Modules 11.
- The Hybrid/EV Battery Interface Control Modules 11–12 are all internal to the K112 Hybrid/EV Battery Interface Control Module.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that P3031, P3032, P3033, P3034, or P3037 is not set.

⇒ **If any of the DTCs are set**

Replace the K112 Hybrid/EV Battery Interface Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC P303C-P303F or P3042

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P303C: Hybrid/EV Battery Interface Control Module 12 Read Only Memory
DTC P303D: Hybrid/EV Battery Interface Control Module 12 Random Access Memory
DTC P303E: Hybrid/EV Battery Interface Control Module 12 Long Term Memory Performance
DTC P303F: Hybrid/EV Battery Interface Control Module 12 Performance
DTC P3042: Hybrid/EV Battery Interface Control Module 12 Processor Performance

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Hybrid/EV Battery Interface Control Module 12 will diagnose its own systems and determine when a fault condition is present. This diagnostic applies to internal microprocessor integrity conditions within the Hybrid/EV Battery Interface Control Module 12. This fault is internal to the Hybrid/EV Battery Interface Control Module 12 and no external circuits are involved.

Conditions for Running the DTC

- The device is awake.
- The system voltage is at least 9 V.
- DTC U2624 is not set.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

DTCs P303C, P303D, P303E, P303F, and P3042 are type A DTCs.

Conditions for Clearing the DTC

DTCs P303C, P303D, P303E, P303F, and P3042 are type A DTCs.

Diagnostic Aids

- If stored only as a history DTC and not retrieved as a current DTC, do not replace the Hybrid/EV Battery Interface Control Modules 12.
- The Hybrid/EV Battery Interface Control Modules 11–12 are all internal to the K112 Hybrid/EV Battery Interface Control Module.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that P303C, P303D, P303E, P303F, or P3042 is not set.

⇒ **If any of the DTCs are set**

Replace the K112 Hybrid/EV Battery Interface Control Module.

⇓ **If none of the DTCs are set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC U0020

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC U0020: Low Speed CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

Devices connected to the GMLAN serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have programmed information about what messages are needed to be exchanged on the serial data circuits. The messages are also supervised and some periodic messages are used by the receiver device as an availability indication of the transmitter device.

Conditions for Running the DTCs

- Supply voltage to the devices is in the normal operating range.
- The vehicle power mode requires serial data communication to occur.
- The DTC U2100 does not have a current status.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTCs Sets

The device uses a default value for the missing parameter.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold, without a repeat of the malfunction.

Circuit/System Verification

Diagnosis of this DTC is accomplished via the symptom or an additional DTC. Refer to *Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229* or *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

DTC U0073 or U2100

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC U0073: Control Module Communication Bus A Off

DTC U2100: CAN Bus Communication

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The serial data circuits are used to communicate information between the devices. The serial data circuits also connect directly to the data link connector (DLC).

Conditions for Running the DTCs

- Supply voltage to the devices is in the normal operating range.
- The vehicle power mode requires serial data communications.

Conditions for Setting the DTC

The device setting the DTC has attempted to establish communications on the serial data circuits more than 3 times in 5 s.

Action Taken When the DTCs Sets

- The device suspends all message transmission.
- The device uses default values for all parameters received on the serial data circuits.
- In the transmission control module, DTC U0073 will cause the transmission to go into default gears.
- In the engine control module and transmission control module, DTC U0073 will cause the malfunction indicator lamp (MIL) to illuminate.
- If equipped with eAssist, DTC U0073 in the hybrid powertrain control module is a type B DTC and will cause the malfunction indicator lamp to illuminate and result in the engine operating in conventional engine mode and will maintain 14 V module operation.
- The device inhibits the setting of all other communication DTCs.

Conditions for Clearing the DTC

- The engine control module or transmission control module turns OFF the MIL after 4 consecutive ignition cycles that the diagnostic runs and does not fail.
- If equipped with eAssist, the hybrid powertrain control module turns off the MIL after the diagnostic runs and does not fail during subsequent ignition cycles. Normal operation will resume 5 s after subsequent ignition cycle.
- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Circuit/System Verification

1. Refer to *Data Link References on page 11-232* to determine which serial data communication system is used for a specific device.
2. This DTC may not be retrieved with a current status. Diagnosis is accomplished using the symptom. Refer to *Symptoms - Data Communications on page 11-218*.

DTC U0074

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U0074: Control Module Communication Powertrain Expansion CAN Bus Off

For symptom byte information, refer to *Symptom Byte List on page 6-117.*

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Powertrain High Speed GMLAN Serial Data (+)	U0074	U0074, U0100-U02FF*	U0074	—
Powertrain High Speed GMLAN Serial Data (-)	U0074	U0074, U0100-U02FF*	U0074	—
Ground (auxiliary data connector terminal 5)	—	U0074	—	—
* An open in only one powertrain high speed GMLAN serial data circuit may allow degraded communication between the devices.				

Circuit/System Description

The serial data is transmitted on two twisted wires that allow speeds up to 500 Kb/s. The twisted pair is terminated with two 120 Ω resistors, one is internal to the engine control module (ECM) and the other can be a separate resistor in a connector assembly or in another device. The resistors are used as the load for the powertrain high speed GMLAN bus during normal vehicle operation. The powertrain high speed GMLAN is a differential bus. The powertrain high speed GMLAN serial data bus (+) and powertrain high speed GMLAN serial data (-) are driven to opposite extremes from a rest or idle level of approximately 2.5 V. Driving the lines to their extremes, adds 1 V to the powertrain high speed GMLAN serial data bus (+) circuit and subtracts 1 V from the powertrain high speed GMLAN serial data bus (-) circuit. If serial data is lost, devices will set a no communication code against the non-communicating device. Note that a loss of serial data DTC does not represent a failure of the device that set it.

The powertrain high speed GMLAN serial data circuits connect directly to the auxiliary data connector. The scan tool does not communicate with powertrain high speed GMLAN bus.

Conditions for Running the DTC

- Supply voltage to the devices are in the normal operating range.
- The vehicle power mode requires serial data communications.

Conditions for Setting the DTC

The device setting the DTC has attempted to establish communications on the powertrain high speed GMLAN serial data circuits more than 3 times.

Action Taken When the DTC Sets

- The device suspends all message transmission.
- The MIL and battery indicators will illuminate, along with several DIC messages.
- DTC U0074 is a type A DTC.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold, without a repeat of the malfunction.
- DTC U0074 is a type A DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- The engine will not start when there is a total malfunction of the powertrain high speed GMLAN serial data bus.
- Use *Data Link References on page 11-232* to determine which devices connect to the powertrain high speed GMLAN serial data bus.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify two or more devices are not communicating on the powertrain high speed GMLAN serial data circuit. Refer to *Data Link References on page 11-232* to determine how many devices should be communicating on the bus.

⇒ **If only one device is not communicating**

Refer to Circuit/System Testing – Testing the Device Circuits.

⇓ **If two or more devices are not communicating**

3. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the scan tool from the X84 data link connector. The following tests will be done at the X84B auxiliary data connector. It may take up to 2 minutes for all vehicle systems to power down.
4. Test for less than 10 Ω between the ground circuit terminal 5 and ground.

⇒ **If 10 Ω or greater**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

5. Vehicle in Service Mode.
6. Test for less than 4.5 V between the serial data circuits listed below and ground.
   - Terminal 12
   - Terminal 13

⇒ **If 4.5 V or greater**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short to Voltage.

⇓ **If less than 4.5 V**

7. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
8. Test for greater than 100 Ω between the serial data circuits listed below and ground.
   - Terminal 12
   - Terminal 13

⇒ **If 100 Ω or less**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short to Ground.

⇓ **If greater than 100 Ω**

9. Test for 50–70 Ω between the serial data circuit terminals 12 and 13.

⇒ **If less than 35 Ω**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short between the Circuits.

⇒ **If between 35–50 Ω**

There may be a third terminating resistor between the serial data circuits. This can happen if the incorrect device is installed. Some devices are available with and without the terminating resistors installed to reduce the need of terminating resistors in the wiring harness. Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short between the Circuits.

⇒ **If greater than 70 Ω but less than infinite**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for an Open/High Resistance.

⇒ **If infinite resistance**

Repair the open/high resistance in the circuit between the X84B auxiliary data connector and the first splice/device in the serial data circuit.

⇓ **If between 50–70 Ω**

10. Refer to Circuit/System Testing – Testing the Device Circuits.

Circuit/System Testing

Note: Some devices with an internal terminating resistor have a loop in the harness that connects the internal terminating resistor to the serial data circuit. When wired this way, test these loop circuits for the appropriate failure mode short to voltage, short to ground, or open/high resistance prior to replacing the device for each of the following tests.

Each device may need to be disconnected to isolate a circuit fault. Use the schematics and connector end views to identify the following:

- Powertrain high speed GMLAN devices the vehicle is equipped with
- Powertrain high speed GMLAN serial data circuit terminating resistors
- Device locations on the powertrain high speed GMLAN serial data circuits
- Each device's ground, B+, ignition, and powertrain high speed GMLAN serial data circuit terminals

Testing the Serial Data Circuits for a Short to Voltage

1. Vehicle OFF, disconnect the harness connectors with the powertrain high speed GMLAN serial data circuits at an easily accessible device, Vehicle in Service Mode.
2. Test for greater than 4.5 V between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If each serial data circuit is 4.5 V or less**

2.1. Vehicle OFF.

2.2. Test for less than 10 Ω between each of the device's ground circuit terminals and ground.

⇒ If 10 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 10 Ω, replace the device that was disconnected.

⇓ **If any serial data circuit is greater than 4.5 V**

3. Vehicle OFF, disconnect the harness connectors with the powertrain high speed GMLAN serial data circuits at another device, in the direction of the circuit shorted to voltage, Vehicle in Service Mode.
4. Test for greater than 4.5 V between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If each serial data circuit is 4.5 V or less**

4.1. Vehicle OFF.

4.2. Test for less than 10 Ω between each of the device's ground circuit terminals and ground.

⇒ If 10 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 10 Ω, replace the device that was disconnected.

⇓ **If any serial data circuit is greater than 4.5 V**

5. Repeat step 3 until one of the following conditions are isolated:
   - A short to voltage on the serial data circuit between two devices or splice packs, if equipped.
   - A short to voltage on the serial data circuit between a device and a terminating resistor.

Testing the Serial Data Circuits for a Short to Ground

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Disconnect the harness connectors with the powertrain high speed GMLAN serial data circuits at an easily accessible device.
3. Test for greater than 100 Ω between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If each serial data circuit is 100 Ω or greater**

Replace the device that was disconnected.

⇓ **If any serial data circuit is less than 100 Ω**

4. Disconnect the harness connectors with the powertrain high speed GMLAN serial data circuits at another device, in the direction of the circuit shorted to ground.
5. Test for greater than 100 Ω between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If both serial data circuits are 100 Ω or greater**

Replace the device that was disconnected.

⇓ **If any serial data circuit is less than 100 Ω**

6. Repeat step 4 until one of the following conditions are isolated:
   - A short to ground on the serial data circuit between two devices or splice packs, if equipped.
   - A short to ground on the serial data circuit between a device and a terminating resistor.
   - A short to ground on the serial data circuit between the X84B auxiliary data connector and the first device or splice pack.

Testing the Serial Data Circuits for a Short between the Circuits

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Disconnect the harness connectors with the powertrain high speed GMLAN serial data circuits at an easily accessible device that is not communicating.
3. Test for greater than 110 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 110 Ω or greater**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is less than 110 Ω**

4. Connect the harness connectors at the device that was disconnected.
5. Disconnect the harness connectors with the powertrain high speed GMLAN serial data circuits at another device, in the direction of the circuit shorted together.
6. Test for greater than 110 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 110 Ω or greater**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is less than 110 Ω**

7. Repeat step 4 until one of the following conditions are isolated:
   - Serial data circuits shorted together between two devices or splice packs, if equipped.
   - Serial data circuits shorted together between a device and a terminating resistor.
   - Serial data circuits shorted together between the X84B auxiliary data connector and the first device or splice pack.
   - A shorted terminating resistor.

Testing the Serial Data Circuits for an Open/High Resistance

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Disconnect the harness connectors with the powertrain high speed GMLAN serial data circuits at an easily accessible device that is not communicating.
3. Test for less than 130 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuit is 130 Ω or less**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is greater than 130 Ω**

4. Connect the harness connectors at the device that was disconnected.
5. Disconnect the harness connectors with the powertrain high speed GMLAN serial data circuits at another device, in the direction of the circuit with the open/high resistance.
6. Test for less than 130 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 130 Ω or less**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is greater than 130 Ω**

7. Repeat step 4 until one of the following conditions are isolated:
   - An open/high resistance on the serial data circuit between two devices or splice packs, if equipped.
   - An open/high resistance on the serial data circuit between a device and a terminating resistor.
   - An open/high resistance terminating resistor.

Testing the Device Circuits

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Disconnect the harness connectors at an easily accessible device that is not communicating.

3. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

3.1. Vehicle OFF.

3.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

4. Vehicle in Service Mode
5. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

5.1. Vehicle OFF.

5.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

5.1. Vehicle OFF.

5.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the disconnected device.

⇓ **If the test lamp illuminates**

6. Vehicle in Service Mode.
7. If equipped, verify a test lamp illuminates between each ignition circuit terminal, which has a fuse in the circuit, and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

7.1. Vehicle OFF.

7.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

7.1. Vehicle OFF.

7.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the disconnected device.

⇓ **If the test lamp illuminates**

8. Vehicle in Service Mode
9. If equipped, verify a test lamp illuminates between each ignition circuit terminal, which is controlled by a control module, and ground.

⇒ **If the test lamp does not illuminate**

9.1. Vehicle OFF, disconnect the harness connectors at the control module that controls the ignition circuit.

9.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

9.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the control module that controls the ignition circuit.

⇓ **If the test lamp illuminates**

10. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
11. Test for less than 130 Ω between each pair of powertrain high speed GMLAN serial data circuits at the device connector that was just disconnected.

⇒ **If any pair of serial data circuits is greater than 130 Ω**

Repair the open/high resistance in the serial data circuits between the disconnected device and the circuit splice in the serial data circuits.

⇓ **If each pair of serial data circuits is 130 Ω or less**

12. Replace the device that was disconnected.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U0077

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U0077: Control Module Communication Chassis Expansion CAN Bus Off

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The GMLAN high speed chassis expansion bus functions the same as the GMLAN high speed bus, and the two buses operate in parallel. The expansion chassis bus was added to reduce message congestion on the primary high speed bus. Since the GMLAN high speed chassis bus and primary GMLAN high speed bus operate in the same manner, the diagnostics for each are the same.

The chassis high speed GMLAN serial data circuits also connect directly to the data link connector (DLC).

Conditions for Running the DTC

- Supply voltage to the devices are in the normal operating range.
- The vehicle power mode requires serial data communications.

Conditions for Setting the DTC

The device setting the DTC has attempted to establish communications on the chassis high speed GMLAN serial data circuits more than 3 times.

Action Taken When the DTC Sets

- The device suspends all message transmission.
- The device uses default values for all parameters received on the serial data circuits.
- The device inhibits the setting of all other communication DTCs.
- DTC U0077 is a type A DTC.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold, without a repeat of the malfunction.
- DTC U0077 is a type A DTC.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC U0077 is not set.

⇒ **If DTC U0077 is set**

Refer to *Scan Tool Does Not Communicate with Chassis High Speed GMLAN Device on page 11-219*.

⇓ **If DTC U0077 is not set**

3. All OK

DTC U007A

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U007A: Control Module Communication High Voltage Energy Management CAN Bus Off

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
High Voltage Energy Management High Speed GMLAN Serial Data (+)	U007A*	U007A*	U007A*	—
High Voltage Energy Management High Speed GMLAN Serial Data (-)	U007A*	U007A*	U007A*	—
Ground (auxiliary data connector terminal 5)	—	U007A*	—	—
* Other DTCs may be set with this fault.				

Circuit/System Description

Devices connected to the high voltage energy management high speed GMLAN serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices when the vehicle is on. The high voltage energy management high speed GMLAN serial data bus uses a terminating resistor that is in parallel with the high voltage energy management high speed GMLAN (+) and (-) circuits.

The high voltage energy management high speed GMLAN serial data circuits connect directly to the auxiliary data connector. The scan tool does not communicate with high voltage energy management high speed GMLAN bus.

Conditions for Running the DTC

- Supply voltage to the devices are in the normal operating range.
- The vehicle power mode requires serial data communications.

Conditions for Setting the DTC

The device setting the DTC has attempted to establish communications on the high voltage energy management high speed GMLAN serial data circuits more than 3 times.

Action Taken When the DTC Sets

- The device suspends all message transmission.
- The device uses default values for all parameters received on the serial data circuits.
- The device inhibits the setting of all other communication DTCs.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above.

These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- The engine may not start when there is a total malfunction of the high voltage energy management high speed GMLAN serial data bus.
- Use *Data Link References on page 11-232* to determine which devices connect to the high voltage energy management high speed GMLAN serial data bus.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-48900 HEV Safety Kit

For equivalent regional tools, refer to *Special Tools on page 9-549*.

Circuit/System Testing

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- ***Identify how to disable high voltage.***
- ***Identify how to test for the presence of high voltage.***
- ***Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.***

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedures may result in serious injury or death.

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

Note: Some devices with an internal terminating resistor have a loop in the harness that connects the internal terminating resistor to the serial data circuit. When wired this way, test these loop circuits for the appropriate failure mode short to voltage, short to ground, or open/high resistance prior to replacing the device for each of the following tests.

Each device may need to be disconnected to isolate a circuit fault. Use the schematics and connector end views to identify the following:

- High voltage energy management high speed GMLAN devices the vehicle is equipped with
- High voltage energy management high speed GMLAN serial data circuit terminating resistors
- Device locations on the high voltage energy management high speed GMLAN serial data circuits
- Each device's ground, B+, ignition, and high voltage energy management high speed GMLAN serial data circuit terminals

1. Perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to *High Voltage Disabling on page 9-363*.
2. Reconnect the 12 V battery after performing the high voltage disabling procedure.
3. Vehicle in Service Mode.
4. Verify two or more devices are not communicating on the high voltage energy management high speed GMLAN serial data circuit. Refer to *Data Link References on page 11-232* to determine how many devices should be communicating on the bus.

⇒ **If only one device is not communicating**

Refer to Testing the Device Circuits.

⇓ **If two or more devices are not communicating**

5. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the scan tool from the X84 Data Link Connector. The following tests will be done at the X84B Auxiliary Data Connector. It may take up to 2 min for all vehicle systems to power down.
6. Test for less than 10 Ω between the ground circuit terminal 5 and ground.

⇒ **If 10 Ω or greater**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

7. Vehicle in Service Mode.
8. Test for less than 4.5 V between the serial data circuits listed below and ground.
   - Terminal 3
   - Terminal 11

⇒ **If 4.5 V or greater**

Refer to Testing the Serial Data Circuits for a Short to Voltage.

⇓ **If less than 4.5 V**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down.
10. Test for greater than 100 Ω between the serial data circuits listed below and ground.
    - Terminal 3
    - Terminal 11

⇒ **If 100 Ω or less**

Refer to Testing the Serial Data Circuits for a Short to Ground.

⇓ **If greater than 100 Ω**

11. Test for 50–70 Ω between the serial data circuit terminals 3 and 11.

⇒ **If less than 35 Ω**

Refer to Testing the Serial Data Circuits for a Short between the Circuits.

⇒ **If between 35–50 Ω**

There may be a third terminating resistor between the serial data circuits. This can happen if the incorrect device is installed. Some devices are available with and without the terminating resistors installed to reduce the need of terminating resistors in the wiring harness. Refer to Testing the Serial Data Circuits for a Short between the Circuits.

⇒ **If greater than 70 Ω but less than infinite**

Refer to Testing the Serial Data Circuits for an Open/High Resistance.

⇒ **If infinite resistance**

Repair the open/high resistance in the circuit between the X84B Auxiliary Data Connector and the first splice/device in the serial data circuit.

⇓ **If between 50–70 Ω**

12. Refer to Testing the Device Circuits.

Testing the Serial Data Circuits for a Short to Voltage

1. Vehicle OFF, disconnect the harness connectors with the high voltage energy management high speed GMLAN serial data circuits at an easily accessible device, Vehicle in Service Mode.
2. Test for greater than 4.5 V between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If each serial data circuit is 4.5 V or less**

2.1. Vehicle OFF.

2.2. Test for less than 10 Ω between each of the device's ground circuit terminals and ground.

⇒ If 10 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 10 Ω, replace the device that was disconnected.

⇓ **If any serial data circuit is greater than 4.5 V**

3. Vehicle OFF, disconnect the harness connectors with the high voltage energy management high speed GMLAN serial data circuits at another device, in the direction of the circuit shorted to voltage, Vehicle in Service Mode.
4. Test for greater than 4.5 V between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If each serial data circuit is 4.5 V or less**

4.1. Vehicle OFF.

4.2. Test for less than 10 Ω between each of the device's ground circuit terminals and ground.

⇒ If 10 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 10 Ω, replace the device that was disconnected.

⇓ **If any serial data circuit is greater than 4.5 V**

5. Repeat step 3 until one of the following conditions are isolated:
   - A short to voltage on the serial data circuit between two devices or splice packs, if equipped.
   - A short to voltage on the serial data circuit between a device and a terminating resistor.

Testing the Serial Data Circuits for a Short to Ground

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down.
2. Disconnect the harness connectors with the high voltage energy management high speed GMLAN serial data circuits at an easily accessible device.
3. Test for greater than 100 Ω between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If each serial data circuit is 100 Ω or greater**

Replace the device that was disconnected.

⇓ **If any serial data circuit is less than 100 Ω**

4. Disconnect the harness connectors with the high voltage energy management high speed GMLAN serial data circuits at another device, in the direction of the circuit shorted to ground.
5. Test for greater than 100 Ω between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If both serial data circuits are 100 Ω or greater**

Replace the device that was disconnected.

⇓ **If any serial data circuit is less than 100 Ω**

6. Repeat step 4 until one of the following conditions are isolated:
   - A short to ground on the serial data circuit between two devices or splice packs, if equipped.
   - A short to ground on the serial data circuit between a device and a terminating resistor.
   - A short to ground on the serial data circuit between the X84B auxiliary data connector and the first device or splice pack.

Testing the Serial Data Circuits for a Short between the Circuits

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down.
2. Disconnect the harness connectors with the high voltage energy management high speed GMLAN serial data circuits at an easily accessible device that is not communicating.
3. Test for greater than 110 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 110 Ω or greater**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is less than 110 Ω**

4. Connect the harness connectors at the device that was disconnected.
5. Disconnect the harness connectors with the high voltage energy management high speed GMLAN serial data circuits at another device, in the direction of the circuit shorted together.
6. Test for greater than 110 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 110 Ω or greater**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is less than 110 Ω**

7. Repeat step 4 until one of the following conditions are isolated:
   - Serial data circuits shorted together between two devices or splice packs, if equipped.
   - Serial data circuits shorted together between a device and a terminating resistor.
   - Serial data circuits shorted together between the X84B auxiliary data connector and the first device or splice pack.
   - A shorted terminating resistor.

Testing the Serial Data Circuits for an Open/High Resistance

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down.
2. Disconnect the harness connectors with the high voltage energy management high speed GMLAN serial data circuits at an easily accessible device that is not communicating.
3. Test for less than 130 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuit is 130 Ω or less**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is greater than 130 Ω**

4. Connect the harness connectors at the device that was disconnected.
5. Disconnect the harness connectors with the high voltage energy management high speed GMLAN serial data circuits at another device, in the direction of the circuit with the open/high resistance.
6. Test for less than 130 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 130 Ω or less**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is greater than 130 Ω**

7. Repeat step 4 until one of the following conditions are isolated:
   - An open/high resistance on the serial data circuit between two devices or splice packs, if equipped.
   - An open/high resistance on the serial data circuit between a device and a terminating resistor.
   - An open/high resistance terminating resistor.

Testing the Device Circuits

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down.
2. Disconnect the harness connectors at an easily accessible device that is not communicating.
3. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

3.1. Vehicle OFF.

3.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

4. Vehicle in Service Mode
5. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

5.1. Vehicle OFF.

5.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

5.1. Vehicle OFF.

5.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the disconnected device.

⇓ **If the test lamp illuminates**

6. Vehicle in Service Mode.
7. If equipped, verify a test lamp illuminates between each ignition circuit terminal, which has a fuse in the circuit, and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

7.1. Vehicle OFF.

7.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

7.1. Vehicle OFF.

7.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the disconnected device.

⇓ **If the test lamp illuminates**

8. Vehicle in Service Mode
9. If equipped, verify a test lamp illuminates between each ignition circuit terminal, which is controlled by a control module, and ground.

⇒ **If the test lamp does not illuminate**

9.1. Vehicle OFF, disconnect the harness connectors at the control module that controls the ignition circuit.

9.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

9.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the control module that controls the ignition circuit.

⇓ **If the test lamp illuminates**

10. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down.
11. Test for less than 130 Ω between each pair of high voltage energy management high speed GMLAN serial data circuits at the device connector that was just disconnected.

⇒ **If any pair of serial data circuits is greater than 130 Ω**

Repair the open/high resistance in the serial data circuits between the disconnected device and the circuit splice in the serial data circuits.

⇓ **If each pair of serial data circuits is 130 Ω or less**

12. Replace the device that was disconnected.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U0078

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U0078: Control Module Communication Low Speed CAN Bus Off

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The low speed GMLAN serial data bus is used to communicate information between the devices. The serial data is transmitted over a single wire to the appropriate devices. The low speed GMLAN serial data circuits also connect directly to the data link connector (DLC).

Conditions for Running the DTC

- Supply voltage to the devices are in the normal operating range.
- The vehicle power mode requires serial data communications.

Conditions for Setting the DTC

The device setting the DTC has attempted to establish communications on the serial data circuits more than 3 times in 5 seconds.

Action Taken When the DTC Sets

- The device suspends all message transmission.
- The device uses default values for all parameters received on the serial data circuits.
- The device inhibits the setting of all other communication DTCs.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC U0078 is not set.

⇒ **If DTC U0078 is set**

Refer to *Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229*.

⇓ **If DTC U0078 is not set**

3. All OK

DTC U0100-U02FF

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

For device DTC descriptors, refer to *Control Module U Code List on page 11-18*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U0100-U02FF	U0100-U02FF	—	—
Ignition	U0100–U02FF, U1814, U2099, P06E4, P1EB9	U0100-U02FF	—	—
Low Speed GMLAN Serial Data	U0078, 1	U0100-U02FF	U0078, 1	—
High Speed GMLAN Serial Data (+)	U0073, 2	U0100-U02FF	U0073, 2	—
High Speed GMLAN Serial Data (-)	U0073, 2	U0100-U02FF	U0073, 2	—
Chassis High Speed GMLAN Serial Data (+)	U0077	U0077, U0100-U02FF	U0077	—
Chassis High Speed GMLAN Serial Data (-)	U0077	U0077, U0100-U02FF	U0077	—
Powertrain High Speed GMLAN Serial Data (+)	U0074	U0074, U0100-U02FF	U0074	—
Powertrain High Speed GMLAN Serial Data (-)	U0074	U0074, U0100-U02FF	U0074	—
High Voltage Energy Management High Speed GMLAN Serial Data (+)	U007A	U007A, U0100-U02FF	U007A	—
High Voltage Energy Management High Speed GMLAN Serial Data (-)	U007A	U007A, U0100-U02FF	U007A	—
Ground	—	U0100-U02FF	—	—
1. Scan Tool Does Not Communicate With Most Low Speed GMLAN Device 2. Scan Tool Does Not Communicate With Most High Speed GMLAN Device				

Circuit/System Description

The serial data circuit is the means by which the devices in the vehicle communicate with each other. Once the scan tool is connected to the serial data circuit through the data link connector (DLC) on the driver side, the scan tool can be used to monitor each device for diagnostic purposes and to check for diagnostic trouble codes (DTCs). The auxiliary data connector on the passenger side is used for expansion busses. When the vehicle is on, each device communicating on the serial data circuit sends a state of health message to ensure that the device is operating properly. When a device stops communicating on the serial data circuit, for example if the device loses power or ground, the state of health message it normally sends on the serial data circuit disappears. Other devices on the serial data circuit, which expect to receive that state of health message, detect its absence; those devices in turn set a DTC associated with the loss of state of health of the non-communicating device. The DTC is unique to the device which is not communicating and one or more devices may set the same exact code. A loss of serial data communications DTC does not represent a failure of the devices that contain the stored DTC.

Conditions for Running the DTC

The system voltage is between 9–16 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

- Specific subsystems will not function.
- DTC U0100 in the Transmission Control Module will cause the transmission to go into default gears.
- Both DTC U0100 in the Transmission Control Module and DTC U0101 in the Engine Control Module will cause the malfunction indicator lamp (MIL) to illuminate.

Conditions for Clearing the DTC

- The Engine Control Module or Transmission Control Module turns OFF the MIL after 4 consecutive ignition cycles that the diagnostic runs and does not fail.
- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between some devices and the scan tool with either the low or high speed GMLAN serial data system inoperative. This condition is due to those devices using multiple serial data communication systems.
- Use *Data Link References on page 11-232* to determine what serial data communications the device uses.
- Some devices may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the device.
- Some intermittent communication concerns may be caused by fretting corrosion on the serial data circuit terminals. Inspect all connectors at the device that set the communication DTC, the device that the communication DTC was set against, and any inline harness connectors between the two devices. Do not replace a device based only on fretting corrosion. Refer to bulletin 09-06-03-004 for assistance with the diagnosis and repair of this condition, if applicable.
- This diagnostic can be used for any device that is not communicating, regardless of the type of serial data circuit it is connected to, providing the vehicle is equipped with the device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-48900 HEV Safety Kit

Circuit/System Verification

1. Determine the device that is not communicating. Refer to *Control Module U Code List on page 11-18*.
2. Verify that DTC B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, P0562, P06E4, P1EB9, U0073, U0074, U0077, U0078, U007A, U1814, or U2099 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- ***Identify how to disable high voltage.***
- ***Identify how to test for the presence of high voltage.***
- ***Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.***

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedures may result in serious injury or death.

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, serial data communication enable, accessory wake up serial data 2, high voltage energy management communication enable, and serial data circuit terminals

1. Using the High Voltage Device Chart below, verify that the non-communicating device is not a high voltage device. If the device is a high voltage device, perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to *High Voltage Disabling on page 9-363*.
2. If high voltage disabling is required, reconnect the 12 V battery after performing the high voltage disabling procedure.
3. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect all the harness connectors at the device that is not communicating. It may take up to 2 min for all vehicle systems to power down.
4. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the disconnected device.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.

8. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

8.1. Vehicle OFF.

8.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

8.1. Vehicle OFF.

8.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the disconnected device.

⇓ **If the test lamp illuminates**

9. Vehicle in Service Mode.
10. If equipped, verify a test lamp illuminates between each ignition circuit terminal, which is controlled by a control module, and ground.

⇒ **If the test lamp does not illuminate**

10.1. Vehicle OFF, disconnect the harness connectors at the control module that controls the ignition circuit.

10.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

10.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the control module that controls the ignition circuit.

⇓ **If the test lamp illuminates**

Note: This test step is only applicable to low speed GMLAN devices.

11. Test for less than 4.5 V between each low speed GMLAN serial data circuit terminal and ground.

⇒ **If 4.5 V or greater**

Refer to *Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229* to test for a short to voltage in the serial data circuit.

⇓ **If less than 4.5 V**

12. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down.
13. Test for less than 2 Ω in each of the serial data circuits end to end between the device harness connector and the appropriate X84 Data Link Connector or X84B Auxiliary Data Connector terminals listed below:
    - X84 DLC low speed GMLAN serial data circuit terminal 1
    - X84 DLC high speed GMLAN serial data circuit terminal 6 or 14
    - X84 DLC chassis high speed GMLAN serial data circuit terminal 12 or 13
    - X84B Auxiliary Data Connector powertrain high speed GMLAN serial data circuit terminal 12 or 13
    - X84B Auxiliary Data Connector high voltage energy management high speed GMLAN serial data circuit terminal 3 or 11

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit between the non communicating device and the device setting the DTC or a serial data splice pack.

⇓ **If less than 2 Ω**

Note: The following test step is only applicable to high speed GMLAN devices.

14. Test for 110–130 Ω between each pair of high speed GMLAN serial data circuits.

⇒ **If less than 110 Ω**

Refer to *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224* to test for a short to ground or a short between the serial data circuits.

⇒ **If greater than 130 Ω**

Refer to *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224* to test for an open/high resistance in the serial data circuit.

⇓ **If between 110–130 Ω**

15. Replace the device that is not communicating.

High Voltage Device Chart

Device	Voltage System	Data Link Type
K16 Battery Energy Control Module (BECM)	300 V 12 V	• High Voltage Energy Management High Speed GMLAN • High Speed GMLAN • BECM Dedicated Bus

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U0300-U0336

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

Refer to *Control Module U Code List on page 11-18*.

Circuit/System Description

Some devices must be configured with specific software, serial numbers, vehicle options, or other information. If a device was not properly configured after installation that device may set the appropriate communication DTCs. No external circuit diagnosis is involved.

Conditions for Running the DTC

Battery voltage is between 9–16 V and data link communications operate normally.

Conditions for Setting the DTC

The device is not configured properly.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold, without a repeat of the malfunction.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC U0300-U0336 is not set.

⇒ **If DTC U0300-U0336 is set**

2.1. Program the device specified by the DTC descriptor.

2.2. Verify the DTC does not set.

⇒ If the DTC sets, replace the device specified by the DTC descriptor.

⇓ If the DTC does not set

2.3. All OK.

⇓ **If DTC U0300-U0336 is not set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC U0400-U05FF

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

Refer to *Control Module U Code List on page 11-18*.

Circuit/System Description

Some devices are constantly receiving information from other devices through serial data communication network. The invalid data code will be set when a receiving device detects a discrepancy in information it receives from another device causing its integrity to be questioned. The symptom byte listed in the DTC Descriptor is for engineering reference only. No external circuit diagnosis is involved.

Conditions for Running the DTC

Battery voltage is between 9–16 V and data link communications operate normally.

Conditions for Setting the DTC

The device is not configured properly.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold, without a repeat of the malfunction.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Engine running for 10 seconds.
2. Vehicle in Service Mode.
3. Verify DTC U0400-U05FF is not set.

⇒ **If DTC U0400-U05FF is set along with other DTCs set**

Diagnose all other DTCs first. Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇒ **If DTC U0400-U05FF is set without other DTCs set**

3.1. Program the device specified by the DTC descriptor.

3.2. Verify the DTC does not set.

⇒ If the DTC sets, replace the appropriate device.

⇓ If the DTC does not set

3.3. All OK.

⇓ **If DTC U0400-U05FF is not set**

4. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC U1500-U15FF

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

For device DTC descriptors, refer to *Control Module U Code List on page 11-18*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U1500-U15BF	U1500-U15BF	—	—
Ignition	U1500-U15BF	U1500-U15BF	—	—
LIN Serial Data	U1500-U15BF	U1500-U15BF	U1500-U15BF	—
Ground	—	U1500-U15BF	—	—

Circuit/System Description

The serial data is transmitted over a Local Interconnect Network (LIN) single wire network circuit bus between a master control module and other LIN devices within a particular subsystem. If serial data communication is lost between any of the LIN devices on the LIN bus network, a no communication code against the non-communicating LIN device will be set. A master control module is the one that reports the non communication code. A loss of serial data communications DTC does not represent a failure of the master control module that set it.

Conditions for Running the DTC

The system voltage is between 9–16 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

Specific subsystems will not function.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.

- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication will be available between the master control module and the scan tool if there is a loss of communications with any of the other LIN devices on the LIN bus network.
- Some devices may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the device.
- Some intermittent communication concerns may be caused by fretting corrosion on the serial data circuit terminals. Inspect all connectors at the device that set the communication DTC, the device that the communication DTC was set against, and any inline harness connectors between the two devices. Do not replace a device based only on fretting corrosion. Refer to bulletin 09-06-03-004 for assistance with the diagnosis and repair of this condition, if applicable.
- An open in the LIN bus serial data circuit between the splice pack and a LIN device will only affect that specific LIN device. This type of failure will set a loss of communication DTC for each LIN device affected and the other LIN devices will still communicate.
- This diagnostic procedure can be used to diagnose the common LIN DTCs: U1500, U1501, U1502, U1503, U1504, U1505, U1506, U1507, U1508, U1509, U150E, U150F, U1510, U1511, U1512, U1513, U1514, U1515, U1516, U1517, U1518, U1519, U151A, U151B, U151C, U1520, U1521, U1522, U1523, U1524, U1526, U1528, U152C, U152D, U1530, U1531, U1532, U1534, U1538, U153A, U1540, U1544, U1548, U1549, U154A, U154B, U1550, U1556, U1558, U15E1, U15E3, U15F0, and other DTCs within the U1500–U15FF range.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

Note: Use the schematics to determine the master control module and all LIN devices on the same LIN serial data circuit. Use the connector end view to identify the B+, ignition, ground, and LIN serial data circuit terminals for each of those devices.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down. Disconnect the harness connector at a LIN device that is not communicating.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. Verify a test lamp illuminates between each B+ circuit terminal and ground, if equipped.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF, remove the test lamp.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF, remove the test lamp.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the disconnected LIN device.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. Verify a test lamp illuminates between each ignition circuit terminal and ground, if equipped.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF, remove the test lamp.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF, remove the test lamp.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the disconnected LIN device.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. Verify a test lamp illuminates between each ignition circuit terminal, which is controlled by a control module, and ground, if equipped.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, remove the test lamp, disconnect the harness connectors at the control module that controls the ignition circuit.

8.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the control module that controls the ignition circuit.

⇓ **If the test lamp illuminates**

9. Vehicle in Service Mode.
10. Test for 2–13 V between the LIN serial data circuit terminal and ground.

⇒ **If less than 2 V**

10.1. Vehicle OFF, disconnect the harness connector at the control module setting the DTC and all LIN devices that share the same LIN serial data circuit.

10.2. Test for infinite resistance between the serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

10.3. Test for less than 2 Ω in the serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇓ If less than 2 Ω

10.4. Reconnect the control module that set the DTC, Vehicle in Service Mode.

10.5. Test for 2–13 V between the LIN serial data circuit terminal and ground.

⇒ If less than 2 V, replace the control module setting the DTC.

⇒ If greater than 2 V, replace the LIN device that causes a current DTC to set when connected.

⇒ **If greater than 13 V**

10.1. Vehicle OFF, disconnect the harness connector at the control module setting the DTC and all LIN devices that share the same LIN serial data circuit.

10.2. Vehicle in Service Mode.

10.3. Test for less than 1 V between the serial data circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇓ If less than 1 V

10.4. Vehicle OFF, reconnect the control module that set the DTC, Vehicle in Service Mode.

10.5. Test for 2–13 V between the LIN serial data circuit terminal and ground.

⇒ If greater than 13 V, replace the control module setting the DTC.

⇒ If less than 13 V, replace the LIN device that causes a current DTC to set when connected.

⇓ **If between 2–13 V**

11. Replace the disconnected LIN device.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U179A

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U179A: Lost Communication with Hybrid Powertrain Control Module 2

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U179A	U179A	—	—
Ignition	U179A	U179A	—	—
Accessory Wakeup Serial Data	U1814	U179A	—	—
Low Speed GMLAN Serial Data	1	U179A	1	—
High Speed GMLAN Serial Data (+)	2	U179A, U0073	2	—
High Speed GMLAN Serial Data (-)	2	U179A, U0073	2	—
Powertrain High Speed GMLAN Serial Data (+)	U0074	U179A, U0074	U0074	—
Powertrain High Speed GMLAN Serial Data (-)	U0074	U179A, U0074	U0074	—
High Voltage Energy Management High Speed GMLAN Serial Data (+)	U007A	U179A, U007A	U007A	—
High Voltage Energy Management High Speed GMLAN Serial Data (-)	U007A	U179A, U007A	U007A	—
Ground	—	U179A	—	—
1. Scan Tool Does Not Communicate With Low Speed GMLAN Device 2. Scan Tool Does Not Communicate With High Speed GMLAN Device				

Circuit/System Description

The serial data circuit is the means by which the devices in the vehicle communicate with each other. Once the scan tool is connected to the serial data circuit through the Data Link Connector (DLC), the scan tool can be used to monitor each device for diagnostic purposes and to check for diagnostic trouble codes (DTC). When the vehicle is on, each device communicating on the serial data circuit sends a state of health message to ensure that the device is operating properly. When a device stops communicating on the serial data circuit, for example if the device loses power or ground, the state of health message it normally sends on the serial data circuit disappears. Other devices on the serial data circuit, which expect to receive that state of health message, detect its absence; those devices in turn set a DTC associated with the loss of state of health of the non communicating device. A loss of serial data communications DTC does not represent a failure of the devices that contain the stored DTC.

Conditions for Running the DTC

The system voltage is between 9–16 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

DTC U179A is a type A DTC.

Conditions for Clearing the DTC

DTC U179A is a type A DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0077, U0078, U007A, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the accessory wakeup serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 min for all vehicle systems to power down.
10. Test for less than 2 Ω in each serial data circuits end to end between the K114B Hybrid/EV Powertrain Control Module 2 and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1803

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1803: Lost Communication with Hybrid Powertrain Control Module 2

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U1803	U1803	—	—
Ignition	U1803	U1803	—	—
Accessory Wakeup Serial Data	U1814	U1803	—	—
Low Speed GMLAN Serial Data	1	U1803	1	—
High Speed GMLAN Serial Data (+)	2	U1803, U0073	2	—
High Speed GMLAN Serial Data (-)	2	U1803, U0073	2	—
Powertrain High Speed GMLAN Serial Data (+)	U0074	U1803, U0074	U0074	—
Powertrain High Speed GMLAN Serial Data (-)	U0074	U1803, U0074	U0074	—
High Voltage Energy Management High Speed GMLAN Serial Data (+)	U007A	U1803, U007A	U007A	—
High Voltage Energy Management High Speed GMLAN Serial Data (-)	U007A	U1803, U007A	U007A	—
Ground	—	U1803	—	—
1. Scan Tool Does Not Communicate With Low Speed GMLAN Device 2. Scan Tool Does Not Communicate With High Speed GMLAN Device				

Circuit/System Description

The serial data circuit is the means by which the devices in the vehicle communicate with each other. Once the scan tool is connected to the serial data circuit through the Data Link Connector (DLC), the scan tool can be used to monitor each device for diagnostic purposes and to check for diagnostic trouble codes (DTC). When the vehicle is on, each device communicating on the serial data circuit sends a state of health message to ensure that the device is operating properly. When a device stops communicating on the serial data circuit, for example if the device loses power or ground, the state of health message it normally sends on the serial data circuit disappears. Other devices on the serial data circuit, which expect to receive that state of health message, detect its absence; those devices in turn set a DTC associated with the loss of state of health of the non communicating device. A loss of serial data communications DTC does not represent a failure of the devices that contain the stored DTC.

Conditions for Running the DTC

The system voltage is between 9–16 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The device is never signaled. Therefore, the specific subsystems will not function.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0077, U0078, U007A, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the accessory wakeup serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 min for all vehicle systems to power down.
10. Test for less than 2 Ω in each serial data circuits end to end between the K114B Hybrid/EV Powertrain Control Module 2 and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1806

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1806: Battery Energy Control Module High Voltage Energy Management CAN Bus Off

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The high voltage energy management high speed GMLAN serial data circuits are serial data buses used to communicate information between the Hybrid Powertrain Control Module 2, the Battery Energy Control Module, and the Battery Charger. If this serial data system is inoperative the devices will not communicate with each other on this bus, but they still communicate with the scan tool through high speed GMLAN bus.

The scan tool does not communicate with devices through the high voltage energy management high speed GMLAN bus. The high voltage energy high speed GMLAN serial data circuits connect directly to the auxiliary data connector and do not connect with the scan tool.

Conditions for Running the DTC

- Vehicle ON.
- The system voltage is at least 9 V.

Conditions for Setting the DTC

The device setting the DTC has attempted to establish communications on the serial data circuits for more than 1.4 seconds without success.

Action Taken When the DTC Sets

The DTC U1806 is a type B DTC.

Conditions for Clearing the DTC

The DTC U1806 is a type B DTC.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC U1806 is not set.

⇒ **If DTC U1806 is set**

Refer to *DTC U007A on page 11-75*.

⇓ **If DTC U1806 is not set**

3. All OK

DTC U1807

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1807: Battery Charger Control Module High Voltage Energy Management CAN Bus Off

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The high voltage energy management high speed GMLAN serial data circuits are serial data buses used to communicate information between the devices. The high voltage energy management high speed GMLAN serial data circuits also connect directly to the auxiliary data connector. If this serial data system is inoperative the devices will still communicate with the scan tool due to other serial data systems but not with each other.

Conditions for Running the DTC

- Supply voltage to the devices are in the normal operating range.
- The vehicle power mode requires serial data communications.

Conditions for Setting the DTC

The device setting the DTC has attempted to establish communications on the high voltage energy management high speed GMLAN serial data circuits more than 3 times.

Action Taken When the DTC Sets

DTC U1807 is a type A DTC.

Conditions for Clearing the DTC

DTC U1807 is a type A DTC.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC U1807 is not set.

⇒ **If DTC U1807 is set**

Refer to *DTC U007A on page 11-75*.

⇓ **If DTC U1807 is not set**

3. All OK

DTC U180A

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U180A: Electric A/C Compressor Control Module High Speed CAN Bus Off

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The high speed GMLAN serial data circuits are serial data buses used to communicate information between the devices. The high speed GMLAN serial data circuits also connect directly to the data link connector (DLC) for programming purposes.

Conditions for Running the DTC

- The system voltage is greater than 10.25 V.
- The vehicle power mode requires serial data communications.

Conditions for Setting the DTC

The device setting the DTC has attempted to establish communications on the high speed GMLAN serial data circuits more than 3 times.

Action Taken When the DTC Sets

DTC U180A is a type B DTC.

Conditions for Clearing the DTC

DTC U180A is a type B DTC.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC U180A is not set.

⇒ **If DTC U180A is set**

Refer to *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224*.

⇓ **If DTC U180A is not set**

3. All OK

DTC U180B

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U180B: Battery Energy Control Module High Speed CAN Bus Off

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The high speed GMLAN serial data circuits are serial data buses used to communicate information between the devices. The high speed GMLAN serial data circuits connect directly to the data link connector (DLC) for programming purposes.

This diagnostic is used to check the high speed GMLAN communication bus status.

Conditions for Running the DTC

- Vehicle ON.
- The system voltage is at least 9 V.

Conditions for Setting the DTC

The device setting the DTC has attempted to establish communications on the serial data circuits for more than 1.4 seconds without success.

Action Taken When the DTC Sets

The DTC U180B is a type B DTC.

Conditions for Clearing the DTC

The DTC U180B is a type B DTC.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC U180B is not set.

⇒ **If DTC U180B is set**

Refer to *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224*.

⇓ **If DTC U180B is not set**

3. All OK

DTC U180C

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U180C: Battery Charger Control Module High Speed CAN Bus Off

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The high speed GMLAN serial data circuits are serial data buses used to communicate information between the devices. The high speed GMLAN serial data circuits also connect directly to the data link connector (DLC) for programming purposes.

Conditions for Running the DTC

- Supply voltage to the devices are in the normal operating range.
- The vehicle power mode requires serial data communications.

Conditions for Setting the DTC

The device setting the DTC has attempted to establish communications on the high speed GMLAN serial data circuits more than 3 times.

Action Taken When the DTC Sets

DTC U180C is a type B DTC.

Conditions for Clearing the DTC

DTC U180C is a type B DTC.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC U180C is not set.

⇒ **If DTC U180C is set**

Refer to *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224*.

⇓ **If DTC U180C is not set**

3. All OK

DTC U180D

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U180D: Electronic Brake Control Module Chassis Expansion CAN Bus Off

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The chassis high speed GMLAN serial data circuits are serial data buses used to communicate information between the devices. The chassis high speed GMLAN serial data circuits also connect directly to the data link connector (DLC) for programming purposes. If this serial data system is inoperative, the devices will still communicate with the scan tool due to other serial data systems but not with each other.

Conditions for Running the DTC

- Supply voltage to the devices are in the normal operating range.
- The vehicle power mode requires serial data communications.

Conditions for Setting the DTC

The device setting the DTC has attempted to establish communications on the chassis high speed GMLAN serial data circuits more than 3 times.

Action Taken When the DTC Sets

- The device suspends all message transmission.
- The device uses default values for all parameters received on the serial data circuits.
- The device inhibits the setting of all other communication DTCs.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold, without a repeat of the malfunction.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC U180D is not set.

⇒ **If DTC U180D is set**

Refer to *DTC U0077 on page 11-74*.

⇓ **If DTC U180D is not set**

3. All OK

DTC U1814

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1814: Powertrain Wake-Up Communication Circuit

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	U1814 02*	U0100-U02FF	—	—
* Vehicle will not start.				

Circuit/System Description

The body control module activates the ignition circuit, when the ignition key is in ACC, ON or START. The ignition circuit wakes up the devices for serial data bus communication.

Conditions for Running the DTC

- The system voltage is between 9–16 V.
- The vehicle power mode master requires serial data communication to occur.

Conditions for Setting the DTC

The body control module senses a short to ground on the ignition circuit.

Action Taken When the DTC Sets

- The output command is turned off while the malfunction is present.
- The devices use a default value for the missing parameters until the next ignition cycle.
- The device(s) is never signaled. Therefore, the specific subsystem(s) will not function.
- The vehicle will not start while the circuit is shorted to ground.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

Note: Use the schematics to determine which devices are on the K9 body control module's ignition circuit terminal 22 X4. Use the connector end view to identify the ignition circuit terminal for each of those devices.

1. Vehicle OFF, disconnect the harness connector at an easily accessible device that shares the K9 body control module's ignition circuit terminal 22 X4. Vehicle in Service Mode.
2. Verify that the DTC U1814 remains current.

⇒ **If the DTC becomes history**

Replace the device that was just disconnected.

⇓ **If the DTC remains current**

3. With the prior devices disconnected, repeat steps 1 and 2 for each device on the ignition circuit except the K9 body control module.
4. Vehicle OFF, disconnect the X4 harness connector at the K9 body control module.

5. Test for infinite resistance between the ignition circuit terminal 22 X4 at the K9 body control module and ground.

⇒ **If less than infinite resistance**

Repair the short to ground on the circuit.

⇓ **If infinite resistance**

6. Replace the K9 body control module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1817

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1817: Lost Communication with Hybrid/EV Powertrain Control Module on Powertrain Expansion CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U1817	U1817	—	—
Ignition	U1817	U1817	—	—
Accessory Wake Up Serial Data 2	P06E4, U1817*	U1817*	—	—
Powertrain High Speed GMLAN Serial Data (+)	U0074*	U0074, U1817*	U0074*	—
Powertrain High Speed GMLAN Serial Data (-)	U0074*	U0074, U1817*	U0074*	—
Ground	—	U1817*	—	—
* Other DTCs may set with this fault.				

Circuit/System Description

Devices connected to the Powertrain high speed GMLAN serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

The Motor Control Modules and the Hybrid/EV Powertrain Control Module 1 are all internal to the Power Inverter Module. All circuits to the Hybrid/EV Powertrain Control Module 1 are also internal to the Power Inverter Module and replaced as a single component.

Communication diagnostics for the serial data, including device power and ground as well as the wakeup circuits for Motor Control Modules and the Hybrid/EV Powertrain Control Module 1 are all diagnosed from external sources only to the Power Inverter Module connector because any circuit fault condition within the Power Inverter Module will cause a complete replacement.

Conditions for Running the DTC

- The system voltage is more than 10 V.
- The vehicle power mode master requires serial data communication to occur from this specific device.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

DTC U1817 is a type A DTC.

Conditions for Clearing the DTC

DTC U1817 is a type A DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0293 is not set.

⇒ **If DTC U0293 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0293 is not set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Verify that DTCs U1818, and U182D are not set.

⇒ **If all of the DTCs are set together**

Refer to *DTC U0074 on page 11-69*.

⇓ **If all of the DTCs are not set together**

5. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the low voltage harness connectors at the T6 Power Inverter Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the T6 Power Inverter Module case and ground.

⇒ **If 10 Ω or greater**

Check the ground connection and ground strap for the open/high resistance.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.

4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T6 Power Inverter Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T6 Power Inverter Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 min for all vehicle systems to power down.
10. Test for less than 2 Ω in each of the Powertrain high speed GMLAN serial data circuits end to end between the T6 Power Inverter Module and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the T6 Power Inverter Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1818

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1818: Lost Communication with Engine Control Module on Powertrain Expansion Communication Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U1818	U1818	—	—
Ignition	U1818	U1818	—	—
Accessory Wake Up Serial Data 2	P06E4*	U1818	—	—
Powertrain High Speed GMLAN Serial Data (+)	U0074*	U1818, U0074*	U0074*	—
Powertrain High Speed GMLAN Serial Data (-)	U0074*	U1818, U0074*	U0074*	—
Ground	—	U1818	—	—
* Other DTCs may set with this fault.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

- The system voltage is at least 10 V.
- The vehicle power mode master requires serial data communication to occur from this specific device.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

DTC U1818 is a type A DTC.

Conditions for Clearing the DTC

DTC U1818 is a type A DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0100 is not set.

⇒ **If DTC U0100 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0100 is not set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Verify that DTCs U1817 and U182D are not set.

⇒ **If all of the DTCs are set together**

Refer to *DTC U0074 on page 11-69*.

⇓ **If all of the DTCs are not set together**

5. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the K20 Engine Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 min for all vehicle systems to power down.
10. Test for less than 2 Ω in each of the Powertrain high speed GMLAN serial data circuits end to end between the K20 Engine Control Module and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K20 Engine Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U182D

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U182D: Lost Communication with Hybrid/EV Powertrain Control Module 2 on Powertrain Expansion Communication Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U182D	U182D	—	—
Ignition	U182D	U182D	—	—
Accessory Wake Up Serial Data	U1814	U182D	—	—
Powertrain High Speed GMLAN Serial Data (+)	U0074*	U182D, U0074	U0074*	—
Powertrain High Speed GMLAN Serial Data (-)	U0074*	U182D, U0074	U0074*	—
Ground	—	U182D	—	—
* Other DTCs may set with this fault.				

Circuit/System Description

The serial data circuit is the means by which the devices in the vehicle communicate with each other. Once the scan tool is connected to the serial data circuit through the Data Link Connector (DLC), the scan tool can be used to monitor each device for diagnostic purposes and to check for diagnostic trouble codes (DTC). When the vehicle is on, each device communicating on the serial data circuit sends a state of health message to ensure that the device is operating properly. When a device stops communicating on the serial data circuit, for example if the device loses power or ground, the state of health message it normally sends on the serial data circuit disappears. Other devices on the serial data circuit, which expect to receive that state of health message, detect its absence; those devices in turn set a DTC associated with the loss of state of health of the non communicating device. A loss of serial data communications DTC does not represent a failure of the devices that contain the stored DTC.

Conditions for Running the DTC

The system voltage is at least 11 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received for 10 s.

Action Taken When the DTC Sets

The DTC U182D is a type B DTC.

Conditions for Clearing the DTC

The DTC U182D is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.

  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Verify that DTCs U1817 and U1818 are not set.

⇒ **If all of the DTCs are set together**

Refer to *DTC U0074 on page 11-69*.

⇓ **If all of the DTCs are not set together**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/ EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/ EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the accessory wakeup serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 min for all vehicle systems to power down.
10. Test for less than 2 Ω in each Powertrain high speed GMLAN serial data circuits end to end between the K114B Hybrid/EV Powertrain Control Module 2 and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U182E

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC U182E: Drive Motor Control Module 1 Lost Communication with Hybrid/EV Powertrain Control Module 2 on Powertrain Expansion Communication Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U182E	U182E	—	—
Ignition	U182E	U182E	—	—
Accessory Wake Up Serial Data	U1814, U2099	U182E	—	—
Powertrain High Speed GMLAN Serial Data (+)	U0074*	U182E, U0074	U0074*	—
Powertrain High Speed GMLAN Serial Data (-)	U0074*	U182E, U0074	U0074*	—
Ground	—	U182E	—	—
* Other DTCs may set with this fault.				

Circuit/System Description

The serial data circuit is the means by which the devices in the vehicle communicate with each other. Once the scan tool is connected to the serial data circuit through the Data Link Connector (DLC), the scan tool can be used to monitor each device for diagnostic purposes and to check for diagnostic trouble codes (DTC). When the vehicle is on, each device communicating on the serial data circuit sends a state of health message to ensure that the device is operating properly. When a device stops communicating on the serial data circuit, for example if the device loses power or ground, the state of health message it normally sends on the serial data circuit disappears. Other devices on the serial data circuit, which expect to receive that state of health message, detect its absence; those devices in turn set a DTC associated with the loss of state of health of the non communicating device. A loss of serial data communications DTC does not represent a failure of the devices that contain the stored DTC.

Conditions for Running the DTC

The system voltage is at least 10 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The DTC U182E is a type B DTC.

Conditions for Clearing the DTC

The DTC U182E is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above.

These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0077, U0078, U007A, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the accessory wakeup serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the X1 harness connector at the T6 Power Inverter Module. It may take up to 2 min for all vehicle systems to power down.
10. Test for less than 2 Ω in each Powertrain high speed GMLAN serial data circuits end to end between the K114B Hybrid/EV Powertrain Control Module 2 and the T6 Power Inverter Module.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1833

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1833: Lost Communication with Electronic Brake Control Module on Chassis Expansion CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U0121, U0129, U1833	U0121, U0129, U1833	—	—
Ignition	U0121, U0129, U1833	U0121, U0129, U1833	—	—
Accessory Wake Up Serial Data 2	P06E4, U0121, U0129, U1833	U0121, U0129, U1833	—	—
Chassis High Speed GMLAN Serial Data (+)	U0077*	U0121, U0129, U1833, U0077*	U0077*	—
Chassis High Speed GMLAN Serial Data (-)	U0077*	U0121, U0129, U1833, U0077*	U0077*	—
Ground	—	U0121, U0129, U1833	—	—
* Other DTCs may set with this fault.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

The system voltage is at least 10 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

- A driver information center message and/or a warning indicator may be displayed.
- The DTC U1833 is a type B DTC.

Conditions for Clearing the DTC

The DTC U1833 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.

  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0121 or U0129 is not set.

⇒ **If any of the DTCs are set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If none of the DTCs are set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the K17 Electronic Brake Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K17 Electronic Brake Control Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K17 Electronic Brake Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 min for all vehicle systems to power down.
10. Test for less than 2 Ω in each Chassis high speed GMLAN serial data circuits end to end between the K17 Electronic Brake Control Module and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K17 Electronic Brake Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1838

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1838: Lost Communication with Battery Charger Control Module on High Voltage Energy Management CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U1838	U1838	—	—
Ignition	U1838	U1838	—	—
Accessory Wake Up Serial Data 2	P06E4, U1838*	U1838	—	—
High Voltage Energy Management Communication Enable	P1EB9, U1838*	U1838	—	—
High Voltage Energy Management High Speed GMLAN Serial Data (+)	U007A*	U007A, U1838*	U007A*	—
High Voltage Energy Management High Speed GMLAN Serial Data (-)	U007A*	U007A, U1838*	U007A*	—
Ground	—	U1838	—	—
* Other DTCs may be set with this fault.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

The system voltage is more than 10 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The DTC U1838 is a type A DTC.

Conditions for Clearing the DTC

The DTC U1838 is a type A DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above.

These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Verify that DTC U185A is not set.

⇒ **If DTC U185A is set**

Refer to *DTC U007A on page 11-75*.

⇓ **If DTC U185A is not set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, high voltage energy management communication enable, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the low voltage harness connector at the T18 Battery Charger. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T18 Battery Charger.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T18 Battery Charger.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Vehicle in Service Mode.
10. If equipped, verify a test lamp illuminates between the high voltage energy management communication enable circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

10.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

10.2. Test for infinite resistance between the high voltage energy management communication enable circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

10.3. Test for less than 2 Ω in the high voltage energy management communication enable circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

11. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 min for all vehicle systems to power down.
12. Test for less than 2 Ω in each high voltage energy management high speed GMLAN serial data circuits end to end between the T18 Battery Charger and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

13. Replace the T18 Battery Charger.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1839

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1839: Auxiliary Transmission Fluid Pump Control Module Lost Communication with Engine Control Module

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U1839	U1839	—	—
Ignition	U1839	U1839	—	—
Accessory Wake Up Serial Data 2	P06E4*	U1839*	—	—
High Speed GMLAN Serial Data (+)	U0073*	U0073, U1839*	U0073*	—
High Speed GMLAN Serial Data (-)	U0073*	U0073, U1839*	U0073*	—
Powertrain High Speed GMLAN Serial Data (+)	U0074*	U0074, U1839*	U0074*	—
Powertrain High Speed GMLAN Serial Data (-)	U0074*	U0074, U1839*	U0074*	—
Ground	—	U1839	—	—
* Other DTCs may set with this fault and multiple symptoms including a no start condition may occur.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

The communication for Auxiliary Transmission Fluid Pump Control Module and all Drive Motor Control Modules is handled through the Hybrid/EV Powertrain Control Module 1. The Auxiliary Transmission Fluid Pump Control Module and the Hybrid/EV Powertrain Control Module 1 are all internal to the Power Inverter Module. All circuits to the Auxiliary Transmission Fluid Pump Control Module and Hybrid/EV Powertrain Control Module 1 are also internal to the Power Inverter Module. Communication diagnostics for the serial data, including device power and ground as well as the wakeup circuits for all Drive Motor Control Modules and the Hybrid/EV Powertrain Control Module 1, are all diagnosed from external sources only to the Power Inverter Module connector.

Conditions for Running the DTC

- The system voltage is at least 10 V.
- The vehicle power mode master requires serial data communication to occur from this specific device.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The DTC U1839 is a type B DTC.

Conditions for Clearing the DTC

The DTC U1839 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0100 is not set.

⇒ **If DTC U0100 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0100 is not set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the K20 Engine Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.

4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the X1 harness connector at the T6 Power Inverter Module. It may take up to 2 min for all vehicle systems to power down.
10. Test for less than 2 Ω in each serial data circuits end to end between the K20 Engine Control Module and the T6 Power Inverter Module.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K20 Engine Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U183C

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U183C: Auxiliary Transmission Fluid Pump Control Module Lost Communication with Hybrid/EV Powertrain Control Module 2 on Powertrain Expansion Communication Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U183C	U183C	—	—
Ignition	U183C	U183C	—	—
Accessory Wake Up Serial Data	U1814, U2099	U183C	—	—
Powertrain High Speed GMLAN Serial Data (+)	U0074*	U0074, U183C*	U0074*	—
Powertrain High Speed GMLAN Serial Data (-)	U0074*	U0074, U183C*	U0074*	—
Ground	—	U183C	—	—
* Other DTCs may set with this fault				

Circuit/System Description

The serial data circuit is the means by which the devices in the vehicle communicate with each other. When the vehicle is ON, each device communicating on the serial data circuit sends a state of health message to ensure that the device is operating properly. When Hybrid/EV Powertrain Control Module 2 stops communicating on the serial data circuit, for example if the Hybrid/EV Powertrain Control Module 2 loses power or ground, the state of health message it normally sends on the serial data circuit disappears. Other devices on the serial data circuit, which expect to receive that state of health message, detect its absence; those devices in turn set a DTC associated with the loss of state of health of the Hybrid/EV Powertrain Control Module 2. A loss of serial data communications DTC does not represent a failure of the devices that contain the stored DTC.

The communication for Auxiliary Transmission Fluid Pump Control Module and Drive Motor Control Module is handled through the Hybrid/EV Powertrain Control Module 1. The Auxiliary Transmission Fluid Pump Control Module and the Hybrid/EV Powertrain Control Module 1 are all internal to the Power Inverter Module. All circuits to the Auxiliary Transmission Fluid Pump Control Module and Hybrid/EV Powertrain Control Module 1 are also internal to the Power Inverter Module. Communication diagnostics for the serial data, including device power and ground as well as the wakeup circuits, for Auxiliary Transmission Fluid Pump Control Module and the Hybrid/EV Powertrain Control Module 1 are all diagnosed from external sources only to the Power Inverter Module connector.

Conditions for Running the DTC

The system voltage is at least 10 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The DTC U183C is a type B DTC.

Conditions for Clearing the DTC

The DTC U183C is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.

4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/ EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/ EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the accessory wakeup serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the X1 harness connector at the T6 Power Inverter Module. It may take up to 2 min for all vehicle systems to power down.
10. Test for less than 2 Ω in each Powertrain high speed GMLAN serial data circuits end to end between the K114B Hybrid/EV Powertrain Control Module 2 and the T6 Power Inverter Module.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U183E

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U183E: Lost Communication with Telematics Communication Interface Control Module on Low Speed CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U183E	U183E	—	—
Ignition	U183E	U183E	—	—
Serial Data Communication Enable	U1814, U2099	U183E	—	—
Low Speed GMLAN Serial Data	U0078*	U0078, U183E	U0078*	—
Ground	—	U183E	—	—
* Scan Tool Does Not Communicate With Low Speed GMLAN Device				

Circuit/System Description

The serial data circuit is the means by which the devices in the vehicle communicate with each other. Once the scan tool is connected to the serial data circuit through the Data Link Connector (DLC), the scan tool can be used to monitor each device for diagnostic purposes and to check for diagnostic trouble codes (DTCs). When the vehicle is ON, each device communicating on the serial data circuit sends a state of health message to ensure that the device is operating properly. When a device stops communicating on the serial data circuit, for example if the device loses power or ground, the state of health message it normally sends on the serial data circuit disappears. Other devices on the serial data circuit, which expect to receive that state of health message, detect its absence; those devices in turn set a DTC associated with the loss of state of health of the non communicating device. A loss of serial data communications DTC does not represent a failure of the devices that contain the stored DTC.

Conditions for Running the DTC

The system voltage is between 9–16 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The device is never signaled. Therefore, the specific subsystems will not function.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.

  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0198 is not set.

⇒ **If DTC U0198 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0198 is not set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, serial data communication enable, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the K73 Telematics Communication Interface Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K73 Telematics Communication Interface Control Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K73 Telematics Communication Interface Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the serial data communication enable circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the serial data communication enable circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the serial data communication enable circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 min for all vehicle systems to power down.
10. Test for less than 2 Ω in the low speed GMLAN serial data circuits end to end between the K73 Telematics Communication Interface Control Module and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K73 Telematics Communication Interface Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1845 or U1846

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC U1845: Drive Motor Control Module 1 Lost Communication with Hybrid/EV Powertrain Control Module

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Drive Motor Control Module 1 and the Hybrid/EV Powertrain Control Module 1 are all internal to the Power Inverter Module. The Drive Motor Control Module 1 communicates only with the Hybrid/EV Powertrain Control Module 1 with the Hybrid/EV Powertrain Control Module 1 sending out diagnostic trouble code information to other devices regarding the Drive Motor Control Module 1. All circuits to the Hybrid/EV Powertrain Control Module 1 and Drive Motor Control Module 1 are also internal to the Power Inverter Module and replaced as a single component.

Communication diagnostics for the serial data, including device power and ground as well as the wakeup circuits for Drive Motor Control Module 1 and the Hybrid/EV Powertrain Control Module 1 are all diagnosed from external sources only to the Power Inverter Module connector because any circuit fault condition within the Power Inverter Module will cause a complete replacement.

Conditions for Running the DTC

- The system voltage is more than 10 V.
- The vehicle power mode master requires serial data communication to occur from this specific device.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The device is never signaled. Therefore, the specific subsystems will not function.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.
- If DTC U1845 is only set current in the Hybrid/EV Powertrain Control Module 1, the Power Inverter Module must be replaced due to all circuits between the Hybrid/EV Powertrain Control Module 1 and Drive Motor Control Module 1 being internal to the Power Inverter Module.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0293 is not set.

⇒ **If DTC U0293 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0293 is not set**

3. Verify that DTC U1845 or U1846 is not set current only in the K114A Hybrid/EV Powertrain Control Module 1.

⇒ **If any of the DTCs are set**

Replace the T6 Power Inverter Module.

⇓ **If none of the DTCs are set**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U184A

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U184A: Lost Communication with Body Control Module on Low Speed CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U184A	U184A	—	—
Ignition	U184A	U184A	—	—
Low Speed GMLAN Serial Data	U0078*	U0078, U184A	U0078*	—
Ground	—	U184A	—	—
* Scan Tool Does Not Communicate With Low Speed GMLAN Device				

Circuit/System Description

The serial data circuit is the means by which the devices in the vehicle communicate with each other. Once the scan tool is connected to the serial data circuit through the data link connector (DLC), the scan tool can be used to monitor each device for diagnostic purposes and to check for diagnostic trouble codes (DTCs). When the vehicle is ON, each device communicating on the serial data circuit sends a state of health message to ensure that the device is operating properly. When a device stops communicating on the serial data circuit, for example if the device loses power or ground, the state of health message it normally sends on the serial data circuit disappears. Other devices on the serial data circuit, which expect to receive that state of health message, detect its absence; those devices in turn set a DTC associated with the loss of state of health of the non communicating device. A loss of serial data communications DTC does not represent a failure of the devices that contain the stored DTC.

Conditions for Running the DTC

The system voltage is between 9–16 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The device is never signaled. Therefore, the specific subsystems will not function.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above.

These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0140 is not set.

⇒ **If DTC U0140 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0140 is not set**

3. Verify that DTC U0073, U0078, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K9 Body Control Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 minutes for all vehicle systems to power down.
8. Test for less than 2 Ω in the low speed GMLAN serial data circuits end to end between the K9 Body Control Module and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

9. Replace the K9 Body Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U184B

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U184B: Lost Communication with Remote Heater and Air Conditioning Control Module on Low Speed CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U0164, U184B	U0164, U184B	—	—
Ignition	U0164, U184B	U0164, U184B	—	—
Low Speed GMLAN Serial Data	U0078*	U0078, U0164, U184B	U0078*	—
Ground	—	U0164, U184B	—	—
* Scan Tool Does Not Communicate With Low Speed GMLAN Device				

Circuit/System Description

The serial data circuit is the means by which the devices in the vehicle communicate with each other. Once the scan tool is connected to the serial data circuit through the data link connector (DLC), the scan tool can be used to monitor each device for diagnostic purposes and to check for diagnostic trouble codes (DTCs). When the vehicle is ON, each device communicating on the serial data circuit sends a state of health message to ensure that the device is operating properly. When a device stops communicating on the serial data circuit, for example if the device loses power or ground, the state of health message it normally sends on the serial data circuit disappears. Other devices on the serial data circuit, which expect to receive that state of health message, detect its absence; those devices in turn set a DTC associated with the loss of state of health of the non communicating device. A loss of serial data communications DTC does not represent a failure of the devices that contain the stored DTC.

Conditions for Running the DTC

The system voltage is between 9–16 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The device is never signaled. Therefore, the specific subsystems will not function.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.

  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0164 is not set.

⇒ **If DTC U0164 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0164 is not set**

3. Verify that DTC U0073, U0078, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K33 HVAC Control Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K33 HVAC Control Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K33 HVAC Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 minutes for all vehicle systems to power down.
8. Test for less than 2 Ω in the low speed GMLAN serial data circuits end to end between the K33 HVAC Control Module and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

9. Replace the K33 HVAC Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U184C

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U184C: Lost Communication with Instrument Cluster on Low Speed CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U184C	U184C	—	—
Ignition	U184C	U184C	—	—
Low Speed GMLAN Serial Data	U0078*	U0078, U184C	U0078*	—
Ground	—	U184C	—	—
* Scan Tool Does Not Communicate With Low Speed GMLAN Device				

Circuit/System Description

The serial data circuit is the means by which the devices in the vehicle communicate with each other. Once the scan tool is connected to the serial data circuit through the data link connector (DLC), the scan tool can be used to monitor each device for diagnostic purposes and to check for diagnostic trouble codes (DTCs). When the vehicle is ON, each device communicating on the serial data circuit sends a state of health message to ensure that the device is operating properly. When a device stops communicating on the serial data circuit, for example if the device loses power or ground, the state of health message it normally sends on the serial data circuit disappears. Other devices on the serial data circuit, which expect to receive that state of health message, detect its absence; those devices in turn set a DTC associated with the loss of state of health of the non communicating device. A loss of serial data communications DTC does not represent a failure of the devices that contain the stored DTC.

Conditions for Running the DTC

The system voltage is between 9–16 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The device is never signaled. Therefore, the specific subsystems will not function.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above.

These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0155 is not set.

⇒ **If DTC U0155 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0155 is not set**

3. Verify that DTC U0073, U0078, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the P16 Instrument Cluster. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the P16 Instrument Cluster.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the P16 Instrument Cluster.

⇓ **If the test lamp illuminates**

7. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 minutes for all vehicle systems to power down.
8. Test for less than 2 Ω in the low speed GMLAN serial data circuits end to end between the P16 Instrument Cluster and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

9. Replace the P16 Instrument Cluster.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U184D

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U184D: Lost Communication with Radio on Low Speed CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U184D	U184D	—	—
Ignition	U184D	U184D	—	—
Low Speed GMLAN Serial Data	U0078*	U0078, U184D	U0078*	—
Ground	—	U184D	—	—
* Scan Tool Does Not Communicate With Low Speed GMLAN Device				

Circuit/System Description

The serial data circuit is the means by which the devices in the vehicle communicate with each other. Once the scan tool is connected to the serial data circuit through the data link connector (DLC), the scan tool can be used to monitor each device for diagnostic purposes and to check for diagnostic trouble codes (DTCs). When the vehicle is ON, each device communicating on the serial data circuit sends a state of health message to ensure that the device is operating properly. When a device stops communicating on the serial data circuit, for example if the device loses power or ground, the state of health message it normally sends on the serial data circuit disappears. Other devices on the serial data circuit, which expect to receive that state of health message, detect its absence; those devices in turn set a DTC associated with the loss of state of health of the non communicating device. A loss of serial data communications DTC does not represent a failure of the devices that contain the stored DTC.

Conditions for Running the DTC

The system voltage is between 9–16 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The device is never signaled. Therefore, the specific subsystems will not function.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above.

These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0184 is not set.

⇒ **If DTC U0184 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0184 is not set**

3. Verify that DTC U0073, U0078, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the A11 Radio. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the A11 Radio.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the A11 Radio.

⇓ **If the test lamp illuminates**

7. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 minutes for all vehicle systems to power down.
8. Test for less than 2 Ω in the low speed GMLAN serial data circuits end to end between the A11 Radio and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

9. Replace the A11 Radio.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U184E

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U184E: Lost Communication with Inflatable Restraint Sensing and Diagnostic Module on Low Speed CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U184E	U184E	—	—
Ignition	U184E	U184E	—	—
Low Speed GMLAN Serial Data	U0078*	U0078, U184E	U0078*	—
Ground	—	U184E	—	—
* Scan Tool Does Not Communicate With Low Speed GMLAN Device				

Circuit/System Description

The serial data circuit is the means by which the devices in the vehicle communicate with each other. Once the scan tool is connected to the serial data circuit through the data link connector (DLC), the scan tool can be used to monitor each device for diagnostic purposes and to check for diagnostic trouble codes (DTCs). When the vehicle is ON, each device communicating on the serial data circuit sends a state of health message to ensure that the device is operating properly. When a device stops communicating on the serial data circuit, for example if the device loses power or ground, the state of health message it normally sends on the serial data circuit disappears. Other devices on the serial data circuit, which expect to receive that state of health message, detect its absence; those devices in turn set a DTC associated with the loss of state of health of the non communicating device. A loss of serial data communications DTC does not represent a failure of the devices that contain the stored DTC.

Conditions for Running the DTC

The system voltage is between 9–16 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The device is never signaled. Therefore, the specific subsystems will not function.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above.

These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0151 is not set.

⇒ **If DTC U0151 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0151 is not set**

3. Verify that DTC U0073, U0078, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K36 Inflatable Restraint Sensing and Diagnostic Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If the test lamp illuminates**

7. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 minutes for all vehicle systems to power down.
8. Test for less than 2 Ω in the low speed GMLAN serial data circuits end to end between the K36 Inflatable Restraint Sensing and Diagnostic Module and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

9. Replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1858

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1858: Electronic Brake Control Module Lost Communication with Hybrid Powertrain Control Module on Chassis Expansion CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U1858*	U1858	—	—
Ignition	U1858*	U1858*	—	—
Accessory Wake Up Serial Data 2	P06E4, U1858*	U1858*	—	—
Chassis High Speed GMLAN Serial Data (+)	U0077*	U0077, U1858*	U0077*	—
Chassis High Speed GMLAN Serial Data (-)	U0077*	U0077, U1858*	U0077*	—
Ground	—	U1858*	—	—
* Multiple DTCs may set and multiple symptoms including a no start condition may occur.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

- The system voltage is between 9–16 V.
- The vehicle power mode master requires serial data communication to occur from this specific device.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The device is never signaled. Therefore, the specific subsystems will not function.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.

  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0293 is not set.

⇒ **If DTC U0293 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0293 is not set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the X1 and X2 harness connectors at the T6 Power Inverter Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the T6 Power Inverter Module case and ground.

⇒ **If 10 Ω or greater**

Check the ground connection and ground strap for the open/high resistance.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T6 Power Inverter Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T6 Power Inverter Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K17 Electronic Brake Control Module. It may take up to 2 minutes for all vehicle systems to power down.
10. Test for less than 2 Ω in each chassis high speed GMLAN serial data circuits end to end between the T6 Power Inverter Module and the K17 Electronic Brake Control Module.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the T6 Power Inverter Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U185A

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U185A: Lost Communication with Battery Energy Control Module on High Voltage Energy Management CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U185A*	U185A	—	—
Ignition	U185A*	U185A	—	—
High Voltage Fault Signal	U185A	U185A	—	—
Accessory Wake Up Serial Data 2	P06E4, U185A*	U185A*	—	—
High Voltage Energy Management Communication Enable	P1EB9, U185A*	U185A*	—	—
High Voltage Energy Management High Speed GMLAN Serial Data (+)	U007A*	U007A, U185A*	U007A*	—
High Voltage Energy Management High Speed GMLAN Serial Data (-)	U007A*	U007A, U185A*	U007A*	—
Ground	—	U185A*	—	—
* Multiple DTCs may be set and multiple symptoms including a no start condition may occur.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

The system voltage is more than 10 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received for more than 500 ms.

Action Taken When the DTC Sets

DTC U185A is a type A DTC.

Conditions for Clearing the DTC

DTC U185A is a type A DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.

  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Hybrid/EV Energy Storage Schematics on page 9-348*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

- *EL-48900* HEV Safety Kit
- *EL-51099* Low Voltage Jumper Harness Extension

For equivalent regional tools, refer to *Special Tools on page 9-549*.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U1838 is not set.

⇒ **If DTC U1838 is set**

Refer to *DTC U007A on page 11-75*.

3. Verify that DTC U0111 is not set.

⇒ **If DTC U0111 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0111 is not set**

4. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

5. Refer to Circuit/System Testing.

Circuit/System Testing

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- ***Identify how to disable high voltage.***
- ***Identify how to test for the presence of high voltage.***
- ***Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.***

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedures may result in serious injury or death.

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, high voltage energy management communication enable, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the X357 harness connector at the A4 Hybrid/EV Battery Pack. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K16 Battery Energy Control Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K16 Battery Energy Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. Test for 4.8-5.2 V between the high voltage fault signal circuit terminal 13 and ground.

⇒ **If less than 4.8 V**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the high voltage fault signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the high voltage fault signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇒ **If greater than 5.2 V**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2, Vehicle in Service Mode.

8.2. Test for less than 1 V between the high voltage fault signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If between 4.8–5.2 V**

9. Vehicle in Service Mode.

10. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

10.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

10.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

10.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

11. Vehicle in Service Mode.
12. If equipped, verify a test lamp illuminates between the high voltage energy management communication enable circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

12.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

12.2. Test for infinite resistance between the high voltage energy management communication enable circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

12.3. Test for less than 2 Ω in the high voltage energy management communication enable circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

13. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the device setting the DTC. It may take up to 2 min for all vehicle systems to power down.
14. Test for less than 2 Ω in each high voltage energy management high speed GMLAN serial data circuits end to end between the A4 Hybrid/EV Battery Pack and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

15. Vehicle OFF, reconnect the X357 harness connector at the A4 Hybrid/EV Battery Pack.
16. Perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to *High Voltage Disabling on page 9-363*.
17. Reconnect the 12 V battery.
18. Vehicle OFF, connect the EL-51099 low voltage jumper harness extension.
19. Disconnect the harness connector at the K16 Battery Energy Control Module.
20. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

Repair the open/high resistance in the circuit.

⇓ **If less than 10 Ω**

21. Vehicle in Service Mode.
22. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

Repair the short to ground or the open/high resistance in the circuit.

⇓ **If the test lamp illuminates**

23. Vehicle in Service Mode.
24. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

Repair the short to ground or the open/high resistance in the circuit.

⇓ **If the test lamp illuminates**

25. Vehicle in Service Mode.
26. Test for 4.8-5.2 V between the high voltage fault signal circuit terminal 21 X1 and ground.

⇒ **If less than 4.8 V**

Repair the short to ground or the open/high resistance in the circuit.

⇒ **If greater than 5.2 V**

Repair the short to voltage in the circuit.

⇓ **If between 4.8–5.2 V**

27. Vehicle in Service Mode.
28. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

Repair the short to ground or the open/high resistance in the circuit.

⇓ **If the test lamp illuminates**

29. Vehicle in Service Mode.
30. If equipped, verify a test lamp illuminates between the high voltage energy management communication enable circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

Repair the short to ground or the open/high resistance in the circuit.

⇓ **If the test lamp illuminates**

31. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the X357 harness

connector at the A4 Hybrid/EV Battery Pack. It may take up to 2 min for all vehicle systems to power down.

32. Test for less than 2 Ω in each high voltage energy management high speed GMLAN serial data circuits end to end between the K16 Battery Energy Control Module and the A4 Hybrid/EV Battery Pack.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

⇓ **If less than 2 Ω**

33. Replace the K16 Battery Energy Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U185B

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U185B: Battery Energy Control Module Lost Communication with Hybrid Powertrain Control Module 2 on High Voltage Energy Management CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U185B	U185B	—	—
Ignition	U185B	U185B	—	—
Accessory Wake Up Serial Data	U1814	U185B	—	—
High Voltage Energy Management High Speed GMLAN Serial Data (+)	U007A*	U007A, U185B	U007A*	—
High Voltage Energy Management High Speed GMLAN Serial Data (-)	U007A*	U007A, U185B	U007A*	—
Ground	—	U185B	—	—
* Other DTCs may set with this fault.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

This diagnostic is used to check the loss of communication with the Hybrid/EV Powertrain Control Module 2 on high voltage energy management high speed GMLAN bus. The Battery Energy Control Module supervises a periodic serial data message to check the communication status of the Hybrid/EV Powertrain Control Module 2. If this message is not received within 1 s, this DTC is set.

Conditions for Running the DTC

- The device is awake and communicating.
- The system voltage is at least 9 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received within 1 s.

Action Taken When the DTC Sets

- No Cell Balancing function. However, cell balancing switch diagnostics still run.
- DTC U185B is a type B DTC.

Conditions for Clearing the DTC

DTC U185B is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.

  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-48900 HEV Safety Kit

For equivalent regional tools, refer to *Special Tools on page 9-549*.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0078, U007A, U1814, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- ***Identify how to disable high voltage.***
- ***Identify how to test for the presence of high voltage.***
- ***Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.***

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedures may result in serious injury or death.

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the accessory wakeup serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the X357 harness connector at the A4 Hybrid/EV Battery Pack. It may take up to 2 min for all vehicle systems to power down.
10. Test for less than 2 Ω in each high voltage energy management high speed GMLAN serial data circuits end to end between the K114B Hybrid/EV Powertrain Control Module 2 and the A4 Hybrid/EV Battery Pack.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Vehicle OFF, disable the high voltage system. Refer to *High Voltage Disabling on page 9-363*.
12. Reconnect the 12 V battery.
13. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connector at the K16 Battery Energy Control Module. It may take up to 2 min for all vehicle systems to power down.

14. Test for less than 2 Ω in each high voltage energy management high speed GMLAN serial data circuits end to end between the A4 Hybrid/EV Battery Pack and the K16 Battery Energy Control Module.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

15. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U185C

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U185C: Battery Charger Control Module Lost Communication with Hybrid Powertrain Control Module 2 on High Voltage Energy Management CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U185C	U185C	—	—
Ignition	U185C	U185C	—	—
Accessory Wake Up Serial Data	U1814	U185C	—	—
High Voltage Energy Management High Speed GMLAN Serial Data (+)	U007A*	U007A, U185C	U007A*	—
High Voltage Energy Management High Speed GMLAN Serial Data (-)	U007A*	U007A, U185C	U007A*	—
Ground	—	U185C	—	—
* Other DTCs may set with this fault.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

The system voltage is between 9–16 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The DTC U185C is a type A DTC.

Conditions for Clearing the DTC

The DTC U185C is a type A DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above.

These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0078, U007A, U1814, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the accessory wakeup serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the X1 harness connector at the T18 Battery Charger. It may take up to 2 minutes for all vehicle systems to power down.
10. Test for less than 2 Ω in each high voltage energy management high speed GMLAN serial data circuits end to end between the K114B Hybrid/EV Powertrain Control Module 2 and the T18 Battery Charger.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1860

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1860: Electric A/C Compressor Control Module Lost Communication with Hybrid Powertrain Control Module 2

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U1860	U1860	—	—
Ignition	U1860	U1860	—	—
Accessory Wake Up Serial Data	U1814	U1860	—	—
High Speed GMLAN Serial Data (+)	U0073*	U0073, U1860	U0073*	—
High Speed GMLAN Serial Data (-)	U0073*	U0073, U1860	U0073*	—
Ground	—	U1860	—	—
* Scan Tool Does Not Communicate With High Speed GMLAN Device				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

The system voltage is greater than 10.25 V.

Conditions for Setting the DTC

The A/C Compressor is not able to receive the serial data message from the Hybrid Powertrain Control Module 2 for 3 seconds.

Action Taken When the DTC Sets

The DTC U1860 is a type B DTC.

Conditions for Clearing the DTC

The DTC U1860 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0078, U007A, U1814, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the accessory wakeup serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the X1 harness connector at the G1 A/C Compressor. It may take up to 2 minutes for all vehicle systems to power down.
10. Test for less than 2 Ω in each serial data circuits end to end between the K114B Hybrid/EV Powertrain Control Module 2 and the G1 A/C Compressor.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1861

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1861: Battery Charger Control Module Lost Communication with Engine Control Module

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U1861*	U1861	—	—
Ignition	U1861*	U1861*	—	—
Accessory Wake Up Serial Data 2	P06E4*	U1861*	—	—
High Speed GMLAN Serial Data (+)	U0073*	U0073, U1861*	U0073*	—
High Speed GMLAN Serial Data (-)	U0073*	U0073, U1861*	U0073*	—
Ground	—	U1861*	—	—
* Other DTCs may set with this fault and multiple symptoms including a no start condition may occur.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

- The system voltage is between 9–16 V.
- The vehicle power mode master requires serial data communication to occur from this specific device.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The DTC U1861 is a type B DTC.

Conditions for Clearing the DTC

The DTC U1861 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0100 is not set.

⇒ **If DTC U0100 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0100 is not set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K20 Engine Control Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the X1 harness connector at the T18 Battery Charger. It may take up to 2 minutes for all vehicle systems to power down.
10. Test for less than 2 Ω in each serial data circuits end to end between the K20 Engine Control Module and the T18 Battery Charger.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K20 Engine Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U186A

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U186A: Electronic Brake Control Module Lost Communication with Engine Control Module

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U186A*	U186A*	—	—
Ignition	U186A*	U186A*	—	—
Accessory Wake Up Serial Data 2	P06E4*	U186A*	—	—
High Speed GMLAN Serial Data (+)	U0073*	U0073, U186A*	U0073*	—
High Speed GMLAN Serial Data (-)	U0073*	U0073, U186A*	U0073*	—
Ground	—	U186A*	—	—
* Other DTCs may set, and multiple symptoms including no start may occur.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

- The system voltage is between 9–16 V.
- The vehicle power mode master requires serial data communication to occur from this specific device.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The DTC U186A is a type B DTC.

Conditions for Clearing the DTC

The DTC U186A is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0100 is not set.

⇒ **If DTC U0100 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0100 is not set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K20 Engine Control Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K17 Electronic Brake Control Module. It may take up to 2 minutes for all vehicle systems to power down.
10. Test for less than 2 Ω in each serial data circuits end to end between the K20 Engine Control Module and the K17 Electronic Brake Control Module.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K20 Engine Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U186B

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U186B: Electronic Brake Control Module Lost Communication with Transmission Control Module

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U186B*	U186B*	—	—
Ignition	U186B*	U186B*	—	—
Accessory Wake Up Serial Data 2	P06E4*	U186B*	—	—
High Speed GMLAN Serial Data (+)	U0073*	U0073, U186B*	U0073*	—
High Speed GMLAN Serial Data (-)	U0073*	U0073, U186B*	U0073*	—
Ground	—	U186B*	—	—
* Other DTCs may set and multiple symptoms including a no start condition may occur.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

- The system voltage is between 9–16 V.
- The vehicle power mode master requires serial data communication to occur from this specific device.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The DTC U186B is a type B DTC.

Conditions for Clearing the DTC

The DTC U186B is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0101 is not set.

⇒ **If DTC U0101 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0101 is not set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K71 Transmission Control Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K71 Transmission Control Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K71 Transmission Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K17 Electronic Brake Control Module. It may take up to 2 minutes for all vehicle systems to power down.
10. Test for less than 2 Ω in each serial data circuits end to end between the K71 Transmission Control Module and the K17 Electronic Brake Control Module.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K71 Transmission Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1876

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1876: Drive Motor Control Module 1 Lost Communication with Engine Control Module

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U1876*	U1876	—	—
Ignition	U1876*	U1876*	—	—
Accessory Wake Up Serial Data 2	P06E4*	U1876*	—	—
High Speed GMLAN Serial Data (+)	U0073*	U0073, U1876*	U0073*	—
High Speed GMLAN Serial Data (-)	U0073*	U0073, U1876*	U0073*	—
Powertrain High Speed GMLAN Serial Data (+)	U0074*	U0074, U1876*	U0074*	—
Powertrain High Speed GMLAN Serial Data (-)	U0074*	U0074, U1876*	U0074*	—
Ground	—	U1876*	—	—
* Other DTCs may set with this fault and multiple symptoms including a no start condition may occur.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

- The system voltage is greater than 9.5 V.
- The vehicle power mode master requires serial data communication to occur from this specific device.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The DTC U1876 is a type B DTC.

Conditions for Clearing the DTC

The DTC U1876 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above.

These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0100 is not set.

⇒ **If DTC U0100 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0100 is not set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K20 Engine Control Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the X1 harness connector at the T6 Power Inverter Module. It may take up to 2 minutes for all vehicle systems to power down.
10. Test for less than 2 Ω in each serial data circuits end to end between the K20 Engine Control Module and the T6 Power Inverter Module.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K20 Engine Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U1885

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U1885: Battery Energy Control Module Lost Communication with Hybrid Powertrain Control Module

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U1885*	U1885	—	—
Ignition	U1885*	U1885*	—	—
Accessory Wake Up Serial Data 2	P06E4, U1885*	U1885*	—	—
High Speed GMLAN Serial Data (+)	U0073*	U0073, U1885*	U0073*	—
High Speed GMLAN Serial Data (-)	U0073*	U0073, U1885*	U0073*	—
Ground	—	U1885*	—	—
* Other DTCs may set with this fault and multiple symptoms including a no start condition may occur.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

This diagnostic is used to check the loss of communication with Hybrid/EV Powertrain Control Module 1 on high speed GMLAN bus. The Battery Energy Control Module supervises a periodic serial data message to check the communication status of the Hybrid/EV Powertrain Control Module 1. If this message is not received within 3 s, then this DTC is set.

Conditions for Running the DTC

- Vehicle ON.
- The system voltage is at least 9 V.
- The DTC U180B is not set.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received within 3 s.

Action Taken When the DTC Sets

The DTC U1885 is a type B DTC.

Conditions for Clearing the DTC

The DTC U1885 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.

  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-48900 HEV Safety Kit

For equivalent regional tools, refer to *Special Tools on page 9-549*.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0293 is not set.

⇒ **If DTC U0293 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0293 is not set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- ***Identify how to disable high voltage.***
- ***Identify how to test for the presence of high voltage.***
- ***Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.***

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedures may result in serious injury or death.

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the X1 and X2 harness connectors at the T6 Power Inverter Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the T6 Power Inverter Module case and ground.

⇒ **If 10 Ω or greater**

Check the ground connection and ground strap for the open/high resistance.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T6 Power Inverter Module.

⇓ **If the test lamp illuminates**

5. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

5.1. Vehicle OFF.

5.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

5.1. Vehicle OFF.

5.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T6 Power Inverter Module.

⇓ **If the test lamp illuminates**

6. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

6.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

6.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the X358 harness connector at the A4 Hybrid/EV Battery Pack. It may take up to 2 min for all vehicle systems to power down.
8. Test for less than 2 Ω in each high speed GMLAN serial data circuits end to end between the T6 Power Inverter Module and the A4 Hybrid/EV Battery Pack.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

9. Vehicle OFF, disable the high voltage system. Refer to *High Voltage Disabling on page 9-363*.
10. Reconnect the 12 V battery.
11. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connector at the K16 Battery Energy Control Module. It may take up to 2 min for all vehicle systems to power down.
12. Test for less than 2 Ω in each high speed GMLAN serial data circuits end to end between the A4 Hybrid/EV Battery Pack and the K16 Battery Energy Control Module.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

13. Replace the T6 Power Inverter Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U18A4

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U18A4: Lost Communication with Hybrid/EV Battery DC Charging Communications Gateway Module on High Voltage Energy Management CAN Bus

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U18A4*	U18A4	—	—
Ignition	U18A4*	U18A4	—	—
Serial Data Communication Enable	U2099, U18A4*	U18A4*	—	—
High Voltage Energy Management Communication Enable	P1EB9, U18A4*	U18A4*	—	—
High Voltage Energy Management Serial Data (+)	U007A*	U007A, U18A4*	U007A*	—
High Voltage Energy Management Serial Data (-)	U007A*	U007A, U18A4*	U007A*	—
Ground	—	U18A4*	—	—
* Multiple DTCs may be set and multiple symptoms including a no start condition may occur.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

- The system voltage is more than 10.2 V.
- The High Voltage Energy Management bus communication is enabled for more than 2 s.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received for more than 500 ms.

Action Taken When the DTC Sets

DTC U18A4 is a type B DTC.

Conditions for Clearing the DTC

DTC U18A4 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.

  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Hybrid/EV Energy Storage Schematics on page 9-348*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-92

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, serial data communication enable, high voltage energy management communication enable, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down. Disconnect the low voltage harness connectors at the T24 Battery Charger - DC.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T24 Battery Charger - DC.

⇓ **If the test lamp illuminates**

5. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

5.1. Vehicle OFF.

5.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

5.1. Vehicle OFF.

5.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T24 Battery Charger - DC.

⇓ **If the test lamp illuminates**

6. If equipped, verify a test lamp illuminates between the serial data communication enable circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

6.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

6.2. Test for infinite resistance between the serial data communication enable circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the serial data communication enable circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

7. If equipped, verify a test lamp illuminates between the high voltage energy management communication enable circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

7.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

7.2. Test for infinite resistance between the high voltage energy management communication enable circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

7.3. Test for less than 2 Ω in the high voltage energy management communication enable circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

8. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down. Disconnect the harness connectors at the device setting the DTC.
9. Test for less than 2 Ω in each high voltage energy management serial data circuits end to end between the T24 Battery Charger - DC and the device setting the DTC.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

10. Replace the T24 Battery Charger - DC.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U18B9-U18BF

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U18B9: Primary High Speed CAN Bus Subnet Configuration List

DTC U18BF: Secondary High Speed CAN Bus Subnet Configuration List

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The devices on the high speed GMLAN serial data bus and the chassis high speed GMLAN serial data bus must be programmed with software that specifically identifies the correct type and quantity of devices on the bus based on RPO configuration. If a device was not properly configured after installation, the appropriate U Code may be set for that device. No external circuit diagnosis is involved.

Conditions for Running the DTC

- Voltage supplied to the device is in the normal operating voltage range.
- The vehicle power mode requires serial data communication to occur.

Conditions for Setting the DTC

- The device is not configured properly.
- The device recognises a programming error.
- CAN-Bus configuration is invalid

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold, without a repeat of the malfunction.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC U18B9-U18BF is not set.

⇒ **If DTC U18B9-U18BF is set along with other DTCs set**

Diagnose all other DTCs first. Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇒ **If DTC U18B9-U18BF is set without other DTCs set**

2.1. Program the device that set the DTC.

2.2. Vehicle OFF, remove the scan tool, open and close the driver door. Wait 60 seconds. Vehicle in Service Mode.

2.3. Verify the DTC does not set.

⇒ If the DTC sets, replace the appropriate device.

⇓ If the DTC does not set

2.4. All OK.

⇓ **If DTC U0400-U05FF is not set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC U2099

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U2099: High Speed Communication Enable Circuit

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	U2099 02*	U0100-U02FF	U0100-U02FF	—
* Vehicle will not start.				

Circuit/System Description

The body control module activates the ignition circuit, when the ignition key is in ACC, ON or START. The ignition circuit wakes up the devices for serial data bus communication.

Conditions for Running the DTC

- The system voltage is between 9–16 V.
- The vehicle power mode master requires serial data communication to occur.

Conditions for Setting the DTC

The body control module senses a short to ground on the ignition circuit.

Action Taken When the DTC Sets

- The output command is turned off while the malfunction is present.
- The devices use a default value for the missing parameters until the next ignition cycle.
- The device(s) is never signaled. Therefore, the specific subsystem(s) will not function.
- The vehicle will not start while the circuit is shorted to ground.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

Note: Use the schematics to determine which devices are on the K9 body control module's ignition circuit terminal 23 X4. Use the connector end view to identify the ignition circuit terminal for each of those devices.

1. Vehicle OFF, disconnect the harness connector at an easily accessible device that shares the K9 body control module's ignition circuit terminal 23 X4. Vehicle in Service Mode.
2. Verify that the DTC U2099 remains current.

⇒ **If the DTC becomes history**

Replace the device that was just disconnected.

⇓ **If the DTC remains current**

3. With the prior devices disconnected, repeat steps 1 and 2 for each device on the ignition circuit except the K9 body control module.
4. Vehicle OFF, disconnect the X4 harness connector at the K9 body control module.

5. Test for infinite resistance between the ignition circuit terminal 23 X4 at the K9 body control module and ground.

⇒ **If less than infinite resistance**

Repair the short to ground on the circuit.

⇓ **If infinite resistance**

6. Replace the K9 body control module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U2401

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U2401: Battery Energy Control Module Dedicated Bus 1 Off

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Battery Energy Control Module Dedicated Serial Data (+)	U2401	U2401, U2603–U2606, U2617–U2624	U2401	—
Battery Energy Control Module Dedicated Serial Data (-)	U2401	U2401, U2603–U2606, U2617–U2624	U2401	—

Circuit/System Description

The Battery Energy Control Module (BECM) dedicated bus is a communication bus used to communicate between the Battery Energy Control Module and the Hybrid/EV Battery Interface Control Modules inside the Hybrid/EV Battery Pack assembly. The Battery Energy Control Module dedicated bus does not communicate with the scan tool.

This diagnostic is used to check the internal Battery Energy Control Module dedicated bus off issue. If the transmit error counter of a bus is greater than 255, then the supervisor requests the physical layer to set the bus into the “Bus Off” state and this fail code will happen.

Conditions for Running the DTC

- Vehicle ON.
- The system voltage is at least 9 V.

Conditions for Setting the DTC

The device setting the DTC has received more than 255 transmit errors on the Battery Energy Control Module dedicated serial data circuits in 2 s.

Action Taken When the DTC Sets

DTC U2401 is a type B DTC.

Conditions for Clearing the DTC

DTC U2401 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.

- The engine will not start when there is a total malfunction of the Battery Energy Control Module dedicated bus.
- Technicians may find various Local Area Network (LAN) communication Diagnostic Trouble Codes (DTC) with the scan tool.

Reference Information

Schematic Reference

- *Hybrid/EV Energy Storage Schematics on page 9-348*
- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-92

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-48900 HEV Safety Kit

For equivalent regional tools, refer to *Special Tools on page 9-549*.

Circuit/System Testing

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- ***Identify how to disable high voltage.***
- ***Identify how to test for the presence of high voltage.***
- ***Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.***

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedures may result in serious injury or death.

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

Note: Each device may need to be disconnected to isolate a circuit fault. Use the schematics and connector end views to identify the following:

- Devices connected to the BECM dedicated serial data circuits
- BECM dedicated serial data circuit terminating resistors
- Device locations on the BECM dedicated serial data circuits
- Each device 12 V reference, high voltage fault signal, low reference, and BECM dedicated serial data circuit terminals

1. Perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to *High Voltage Disabling on page 9-363*.
2. Reconnect the 12 V battery.
3. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down. Disconnect the X36 harness connector at the K112 Hybrid/EV Battery Interface Control Module and the X12 harness connector at the K16 Battery Energy Control Module. The following tests will be performed on the BECM dedicated serial data circuits between the K112 Hybrid/EV Battery Interface Control Module and the K16 Battery Energy Control Module.
4. Vehicle in Service Mode.
5. Test for less than 1 V between each serial data circuit and ground.

⇒ **If any serial data circuit are 1 V or greater**

Repair the short to voltage in the circuit.

⇓ **If each serial data circuit are less than 1 V**

6. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down.

7. Test for infinite resistance between each serial data circuit and ground.

⇒ **If any serial data circuit are less than infinite resistance**

Repair the short to ground in the circuit.

⇓ **If each serial data circuit are infinite resistance**

8. Test for infinite resistance between each pair of serial data circuits.

⇒ **If any pair of serial data circuits are less than infinite resistance**

Repair a short together in the circuit.

⇓ **If each pair of serial data circuits are infinite resistance**

9. Test for less than 2 Ω in each serial data circuit end to end.

⇒ **If any serial data circuit are 2 Ω or greater**

Repair the open/high resistance in the circuit.

⇓ **If each serial data circuit are less than 2 Ω**

10. Replace the K112 Hybrid/EV Battery Interface Control Module.
11. Verify that DTC U2401 is not set.

⇒ **If DTC U2401 is set again**

Replace the K16 Battery Energy Control Module.

⇓ **If DTC U2401 is not set**

12. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U2602

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U2602: Battery Energy Control Module Lost Communication with Hybrid Powertrain Control Module 2

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U2602	U2602	—	—
Ignition	U2602	U2602	—	—
Accessory Wake Up Serial Data	U1814	U2602	—	—
High Speed GMLAN Serial Data (+)	U0073*	U0073, U2602*	U0073*	—
High Speed GMLAN Serial Data (-)	U0073*	U0073, U2602*	U0073*	—
Ground	—	U2602	—	—
* Scan Tool Does Not Communicate With High Speed GMLAN Device				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

This diagnostic is used to check the loss of communication with the Hybrid/EV Powertrain Control Module 2 on high speed GMLAN bus. The Battery Energy Control Module supervises a periodic serial data message to check the communication status of the Hybrid/EV Powertrain Control Module 2. If this message is not received within 400 ms, the Battery Energy Control Module increases its fail count. When this fail count is over X Cal Value (7) during Y Cal Value (10 samples), the diagnostic status of this code is set to Failed and transmitted over high voltage energy high speed GMLAN bus to the Hybrid/EV Powertrain Control Module 2.

Conditions for Running the DTC

- Vehicle ON.
- The system voltage is at least 9 V.
- The DTC U180B is not set.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received within 400 ms.

Action Taken When the DTC Sets

The DTC U2602 is a type B DTC.

Conditions for Clearing the DTC

The DTC U2602 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.

  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-48900 HEV Safety Kit

For equivalent regional tools, refer to *Special Tools on page 9-549*.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0078, U007A, U1814, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- ***Identify how to disable high voltage.***
- ***Identify how to test for the presence of high voltage.***
- ***Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.***

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedures may result in serious injury or death.

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the accessory wakeup serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the X357 harness connector at the A4 Hybrid/EV Battery Pack. It may take up to 2 min for all vehicle systems to power down.
10. Test for less than 2 Ω in each serial data circuits end to end between the K114B Hybrid/EV Powertrain Control Module 2 and the A4 Hybrid/EV Battery Pack.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Vehicle OFF, disable the high voltage system. Refer to *High Voltage Disabling on page 9-363*.
12. Reconnect the 12 V battery.
13. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Disconnect the harness connector at the K16 Battery Energy Control Module. It may take up to 2 min for all vehicle systems to power down.

14. Test for less than 2 Ω in each serial data circuits end to end between the A4 Hybrid/EV Battery Pack and the K16 Battery Energy Control Module.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

15. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U2603-U2606 or U2617-U2622

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U2603: Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 1
DTC U2604: Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 2
DTC U2605: Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 3
DTC U2606: Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 4
DTC U2617: Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 5
DTC U2618: Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 6
DTC U2619: Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 7
DTC U2620: Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 8
DTC U2621: Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 9
DTC U2622: Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 10

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
12 V Reference	U2603–U2606, U2617–U2622	U2603–U2606, U2617–U2622	—	—
High Voltage Fault Signal	U2603–U2606, U2617–U2622	U2603–U2606, U2617–U2622	—	—
BECM Dedicated Serial Data (+)	U2401	U2401, U2603–U2606, U2617–U2622	U2401	—
BECM Dedicated Serial Data (-)	U2401	U2401, U2603–U2606, U2617–U2622	U2401	—
Low Reference	—	U2603–U2606, U2617–U2622	—	—

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

The scan tool does not communicate with the Hybrid/EV Battery Interface Control Modules 1–10 on Battery Energy Control Module (BECM) dedicated bus.

Conditions for Running the DTC

- The device is awake and communicating.
- The system voltage is at least 9 V.

Conditions for Setting the DTC

There is no temperature report message from Hybrid/EV Battery Interface Control Modules 1–10 to Battery Energy Control Module within 4 s.

Action Taken When the DTC Sets

The DTC U2603, U2604, U2605, U2606, U2617, U2618, U2619, U2620, U2621, and U2622 are type A DTCs.

Conditions for Clearing the DTC

The DTC U2603, U2604, U2605, U2606, U2617, U2618, U2619, U2620, U2621, and U2622 are type A DTCs.

Diagnostic Aids

- The Hybrid/EV Battery Interface Control Modules 1–10 are all internal to the Battery Energy Control Module.
- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Circuit/System Verification

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

1. Vehicle in Service Mode.
2. Verify that DTC U2401 is not set.

⇒ **If the DTC is set**

Refer to *DTC U2401 on page 11-189*.

⇓ **If the DTC is not set**

3. Verify each scan tool Hybrid/EV Battery 1-96 parameters are between 0.3–4.7 V and within 0.05 V of each other.

⇒ **If the voltage readings of any parameters are not within the specified range**

Refer to *DTC P0B3B-P0BBB, P1B16-P1B2D, P1B45-P1BFE, P1E01-P1E06, or P1E4C-P1E8B on page 9-408*.

⇓ **If the voltage readings of all parameters are within the specified range**

4. Verify that DTC U2603, U2604, U2605, U2606, U2617, U2618, U2619, U2620, U2621, and U2622 is not set.

⇒ **If the DTC is set**

Replace the K16 Battery Energy Control Module.

⇓ **If the DTC is not set**

5. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for device replacement, programming and setup

DTC U2608

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U2608: Electric A/C Compressor Control Module Lost Communication with Hybrid Powertrain Control Module

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U2608	U2608	—	—
Ignition	U2608	U2608	—	—
Accessory Wake Up Serial Data 2	P06E4*	U2608*	—	—
High Speed GMLAN Serial Data (+)	U0073*	U0073, U2608*	U0073*	—
High Speed GMLAN Serial Data (-)	U0073*	U0073, U2608*	U0073*	—
Ground	—	U2608	—	—
* Other DTCs may set with this fault.				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

- The system voltage is greater than 10.25 V.
- The vehicle power mode master requires serial data communication to occur from this specific device.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received for 3 seconds.

Action Taken When the DTC Sets

The DTC U2608 is a type B DTC.

Conditions for Clearing the DTC

The DTC U2608 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0293 is not set.

⇒ **If DTC U0293 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0293 is not set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the X1 and X2 harness connectors at the T6 Power Inverter Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the T6 Power Inverter Module case and ground.

⇒ **If 10 Ω or greater**

Check the ground connection and ground strap for the open/high resistance.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T6 Power Inverter Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T6 Power Inverter Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the X1 harness connector at the G1 A/C Compressor. It may take up to 2 minutes for all vehicle systems to power down.
10. Test for less than 2 Ω in each high speed GMLAN serial data circuits end to end between the T6 Power Inverter Module and the G1 A/C Compressor.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the T6 Power Inverter Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U2609

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U2609: Battery Charger Control Module Lost Communication with Hybrid Powertrain Control Module

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U2609*	U2609	—	—
Ignition	U2609*	U2609*	—	—
Accessory Wake Up Serial Data 2	P06E4*	U2609*	—	—
High Speed GMLAN Serial Data (+)	U0073*	U0073, U2609*	U0073*	—
High Speed GMLAN Serial Data (-)	U0073*	U0073, U2609*	U0073*	—
Ground	—	U2609*	—	—
* Other DTCs may set with this fault and multiple symptoms including a no start condition may occur..				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

- The system voltage is between 9–16 V.
- The vehicle power mode master requires serial data communication to occur from this specific device.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The DTC U2609 is a type B DTC.

Conditions for Clearing the DTC

The DTC U2609 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.

- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0293 is not set.

⇒ **If DTC U0293 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0293 is not set**

3. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data 2, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the X1 and X2 harness connectors at the T6 Power Inverter Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the T6 Power Inverter Module case and ground.

⇒ **If 10 Ω or greater**

Check the ground connection and ground strap for the open/high resistance.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T6 Power Inverter Module.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the T6 Power Inverter Module.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data 2 circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2.

8.2. Test for infinite resistance between the accessory wakeup serial data 2 circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the X1 harness connector at the T18 Battery Charger. It may take up to 2 minutes for all vehicle systems to power down.
10. Test for less than 2 Ω in each high speed GMLAN serial data circuits end to end between the T6 Power Inverter Module and the T18 Battery Charger.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the T6 Power Inverter Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U2611

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U2611: Auxiliary Transmission Fluid Pump Control Module Lost Communication with Hybrid Powertrain Control Module

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The Auxiliary Transmission Fluid Pump Control Module and the Hybrid Powertrain Control Module 1 are all internal to the Power Inverter Module. The Auxiliary Transmission Fluid Pump Control Module communicates only with the Hybrid Powertrain Control Module 1 with the Hybrid Powertrain Control Module 1 sending out diagnostic trouble code information to other devices regarding the Auxiliary Transmission Fluid Pump Control Module. All circuits to the Hybrid Powertrain Control Module 1 and Auxiliary Transmission Fluid Pump Control Module are also internal to the Power Inverter Module and replaced as a single component.

Communication diagnostics for the serial data, including device power and ground as well as the wakeup circuits for Auxiliary Transmission Fluid Pump Control Module and the Hybrid Powertrain Control Module 1 are all diagnosed from external sources only to the Power Inverter Module connector because any circuit fault condition within the Power Inverter Module will cause a complete replacement.

Conditions for Running the DTC

- The system voltage is more than 10 V.
- The vehicle power mode master requires serial data communication to occur from this specific device.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The device is never signaled. Therefore, the specific subsystems will not function.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the device ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.
- If DTC U2611 is only set current in the Hybrid Powertrain Control Module 1, the Power Inverter Module must be replaced due to all circuits between the Hybrid Powertrain Control Module 1

and Auxiliary Transmission Fluid Pump Control Module being internal to the Power Inverter Module.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0293 is not set.

⇒ **If DTC U0293 is set**

Refer to *DTC U0100-U02FF on page 11-81*.

⇓ **If DTC U0293 is not set**

3. Verify that DTC U2611 is not set current only in the K114A Hybrid Powertrain Control Module 1.

⇒ **If DTC U2611 is set**

Replace the T6 Power Inverter Module.

⇓ **If DTC U2611 is not set**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U2612

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U2612: Battery Charger Control Module Lost Communication with Hybrid Powertrain Control Module 2

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U2612	U2612	—	—
Ignition	U2612	U2612	—	—
Accessory Wake Up Serial Data	U1814	U2612	—	—
High Speed GMLAN Serial Data (+)	U0073, 1	U0073, U2612	U0073, 1	—
High Speed GMLAN Serial Data (-)	U0073, 1	U0073, U2612	U0073, 1	—
High Voltage Energy Management High Speed GMLAN Serial Data (+)	U007A*	U007A, U2612	U007A*	—
High Voltage Energy Management High Speed GMLAN Serial Data (-)	U007A*	U007A, U2612	U007A*	—
Ground	—	U2612	—	—
1. Scan Tool Does Not Communicate With High Speed GMLAN Device * Other DTCs may set with this fault				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Conditions for Running the DTC

The system voltage is between 9–16 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received.

Action Taken When the DTC Sets

The DTC U2612 is a type B DTC.

Conditions for Clearing the DTC

The DTC U2612 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.

  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0078, U007A, U1814, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.

6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the accessory wakeup serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the X1 harness connectors at the T18 Battery Charger. It may take up to 2 minutes for all vehicle systems to power down.
10. Test for less than 2 Ω in each serial data circuits end to end between the K114B Hybrid/EV Powertrain Control Module 2 and the T18 Battery Charger.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U2613

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U2613: Drive Motor 1 Control Module Lost Communication with Hybrid/EV Powertrain Control Module 2

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U2613	U2613	—	—
Ignition	U2613	U2613	—	—
Accessory Wake Up Serial Data	U1814, U2099	U2613	—	—
High Speed GMLAN Serial Data (+)	U0073*	U0073, U2613*	U0073*	—
High Speed GMLAN Serial Data (-)	U0073*	U0073, U2613*	U0073*	—
Chassis High Speed GMLAN Serial Data (+)	U0077*	U0077, U2613*	U0077*	—
Chassis High Speed GMLAN Serial Data (-)	U0077*	U0077, U2613*	U0077*	—
Powertrain High Speed GMLAN Serial Data (+)	U0074*	U0074, U2613*	U0074*	—
Powertrain High Speed GMLAN Serial Data (-)	U0074*	U0074, U2613*	U0074*	—
Ground	—	U2613	—	—
* Other DTCs may set with this fault				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

The Drive Motor Control Modules and the Hybrid Powertrain Control Module 1 are all internal to the Power Inverter Module. All circuits to the Drive Motor Control Modules and Hybrid Powertrain Control Module 1 are also internal to the Power Inverter Module. Communication diagnostics for the serial data, including device power and ground as well as the wakeup circuits, for Drive Motor Control Modules and the Hybrid Powertrain Control Module 1 are all diagnosed from external sources only to the Power Inverter Module connector.

Conditions for Running the DTC

The system voltage is at least 11 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received for more than 10 s.

Action Taken When the DTC Sets

The DTC U2613 is a type B DTC.

Conditions for Clearing the DTC

The DTC U2613 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.

4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the accessory wakeup serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the X1 harness connector at the T6 Power Inverter Module. It may take up to 2 minutes for all vehicle systems to power down.
10. Test for less than 2 Ω in each serial data circuits end to end between the K114B Hybrid/EV Powertrain Control Module 2 and the T6 Power Inverter Module.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U2615

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U2615: Auxiliary Transmission Fluid Pump Control Module Lost Communication with Hybrid/EV Powertrain Control Module 2

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U2615	U2615	—	—
Ignition	U2615	U2615	—	—
Accessory Wake Up Serial Data	U1814, U2099	U2615	—	—
High Speed GMLAN Serial Data (+)	U0073*	U0073, U2615*	U0073*	—
High Speed GMLAN Serial Data (-)	U0073*	U0073, U2615*	U0073*	—
Chassis High Speed GMLAN Serial Data (+)	U0077*	U0077, U2615*	U0077*	—
Chassis High Speed GMLAN Serial Data (-)	U0077*	U0077, U2615*	U0077*	—
Powertrain High Speed GMLAN Serial Data (+)	U0074*	U0074, U2615*	U0074*	—
Powertrain High Speed GMLAN Serial Data (-)	U0074*	U0074, U2615*	U0074*	—
Ground	—	U2615	—	—
* Other DTCs may set with this fault				

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

The Auxiliary Transmission Fluid Pump Control Module is controlled by Drive Motor 3 Control Module. The communication for Auxiliary Transmission Fluid Pump Control Module and all Drive Motor Control Modules is handled through the Hybrid Powertrain Control Module 1. The Auxiliary Transmission Fluid Pump Control Module and the Hybrid Powertrain Control Module 1 are all internal to the Power Inverter Module. All circuits to the Auxiliary Transmission Fluid Pump Control Module and Hybrid Powertrain Control Module 1 are also internal to the Power Inverter Module. Communication diagnostics for the serial data, including device power and ground as well as the wakeup circuits, for Auxiliary Transmission Fluid Pump Control Module and the Hybrid Powertrain Control Module 1 are all diagnosed from external sources only to the Power Inverter Module connector.

Conditions for Running the DTC

The system voltage is at least 11 V.

Conditions for Setting the DTC

A supervised periodic message that includes the transmitter device availability has not been received for more than 10 s.

Action Taken When the DTC Sets

The DTC U2615 is a type B DTC.

Conditions for Clearing the DTC

The DTC U2615 is a type B DTC.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status. Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U-code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U-code.
- Do not replace a device reporting a U-code. The U-code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to the device using multiple GMLAN busses.
- Use *Data Link References on page 11-232* to determine what GMLAN serial data communications the non communicating device uses.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U0073, U0074, U0077, U0078, U007A, P06E4, P1EB9, U1814, U2099, B1325, B1330, B1370, B1380, B1424, B1428, B1440, B1441, B1517, C0800, C0899, C12E1, P0560, or P0562 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Note: Use the schematics and connector end views to identify the device's ground, B+, ignition, accessory wake up serial data, and serial data circuit terminals.

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the harness connectors at the K114B Hybrid/EV Powertrain Control Module 2. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.

4. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/ EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

5. Vehicle in Service Mode.
6. If equipped, verify a test lamp illuminates between each ignition circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K114B Hybrid/ EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. If equipped, verify a test lamp illuminates between the accessory wakeup serial data circuit terminal and ground.

⇒ **If the test lamp does not illuminate**

8.1. Vehicle OFF, disconnect the harness connectors at the K9 Body Control Module.

8.2. Test for infinite resistance between the accessory wakeup serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the accessory wakeup serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the X1 harness connector at the T6 Power Inverter Module. It may take up to 2 minutes for all vehicle systems to power down.
10. Test for less than 2 Ω in each serial data circuits end to end between the K114B Hybrid/EV Powertrain Control Module 2 and the T6 Power Inverter Module.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

DTC U2623 or U2624

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC U2623: Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 11

DTC U2624: Battery Energy Control Module Lost Communication with Hybrid/EV Battery Interface Control Module 12

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
12 V Reference	U2623, U2624	U2623, U2624	—	—
High Voltage Fault Signal	U2623, U2624	U2623, U2624	—	—
BECM Dedicated Serial Data (+)	U2401	U2401, U2623, U2624	U2401	—
BECM Dedicated Serial Data (-)	U2401	U2401, U2623, U2624	U2401	—
Low Reference	—	U2623, U2624	—	—

Circuit/System Description

Devices connected to the serial data circuits monitor for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the devices. The devices have prerecorded information about what messages are needed to be exchanged on the serial data circuits, for each virtual network. The messages are supervised and also, some periodic messages are used by the receiver device as an availability indication of the transmitter device. Each message contains the identification number of the transmitter device.

Scan tool does not communicate the Hybrid/EV Battery Interface Control Module 11–12 on Battery Energy Control Module (BECM) dedicated bus. The Hybrid/EV Battery Interface Control Modules 11–12 are all internal to the K112 Hybrid/EV Battery Interface Control Module.

Conditions for Running the DTC

- The device is awake and communicating.
- The system voltage is at least 9 V.

Conditions for Setting the DTC

There is no temperature report message from Hybrid/EV Battery Interface Control Module 11 or 12 to Battery Energy Control Module within 4 s.

Action Taken When the DTC Sets

The DTC U2623 and U2624 are type A DTCs.

Conditions for Clearing the DTC

The DTC U2623 and U2624 are type A DTCs.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.

  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- A device may have a U code stored in history that does not require any repairs. Issues with late or corrupted messages between devices can be temporary with no apparent symptom or complaint; this does not mean the device is faulty. Do not replace a device based only on a history U code.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- The device may not have internal protection for specific control circuits and may open a B+ or ignition fuse. If a fuse is open and the B+ or ignition circuit is not shorted to ground, ensure none of the control circuits are shorted to ground before replacing the non communicating device.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Hybrid/EV Energy Storage Schematics on page 9-348*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-92

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-48900 HEV Safety Kit

For equivalent regional tools, refer to *Special Tools on page 9-549*.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC U2401 is not set.

⇒ **If the DTC is set**

Refer to *DTC U2401 on page 11-189*.

⇓ **If the DTC is not set**

3. Verify each scan tool Hybrid/EV Battery 1–96 parameters are between 0.3–4.7 V and within 0.05 V of each other.

⇒ **If the voltage readings of any parameters are not within the specified range**

Refer to *DTC P0B3B-P0BBB, P1B16-P1B2D, P1B45-P1BFE, P1E01-P1E06, or P1E4C-P1E8B on page 9-408*.

⇓ **If the voltage readings of all parameters are within the specified range**

4. Refer to Circuit/System Testing.

Circuit/System Testing

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

- ***Identify how to disable high voltage.***
- ***Identify how to test for the presence of high voltage.***
- ***Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.***

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedures may result in serious injury or death.

Note: The Battery Pack will utilize an exchange program. Please consult the most recent revision of bulletin/PI #PIP5112, available in Service Information (SI), for a list of approved Battery Pack service procedures. Components that may be removed and serviced without exchanging the complete battery pack are identified in the bulletin/PI. Please contact the GM Technical Assistance Center if you have any questions.

Note: Use the schematics and connector end views to identify the device's 12 V reference, high voltage fault signal, low reference, and serial data circuit terminals.

1. Perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to *High Voltage Disabling on page 9-363*.
2. Reconnect the 12 V battery.
3. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down. Disconnect the X36 harness connector at the K112 Hybrid/EV Battery Interface Control Module.
4. Test for less than 10 Ω between the low reference circuit terminal 12 X36 and ground.

⇒ **If 10 Ω or greater**

4.1. Vehicle OFF, disconnect the X12 harness connector at the K16 Battery Energy Control Module.

4.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K16 Battery Energy Control Module.

⇓ **If less than 10 Ω**

5. Vehicle in Service Mode.
6. Verify that a test lamp illuminates between the 12 V reference circuit terminal 13 X36 and ground.

⇒ **If the test lamp does not illuminate**

6.1. Vehicle OFF, disconnect the X1 harness connector at the K114B Hybrid/EV Powertrain Control Module 2.

6.2. Test for infinite resistance between the 12 V reference circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the 12 V reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

7. Vehicle in Service Mode.
8. Test for 4.8–5.2 V between the high voltage fault signal circuit terminal 9 X36 and ground.

⇒ **If less than 4.8 V**

8.1. Vehicle OFF, disconnect the X12 harness connector at the K16 Battery Energy Control Module.

8.2. Test for infinite resistance between the high voltage fault signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the high voltage fault signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K16 Battery Energy Control Module.

⇒ **If greater than 5.2 V**

8.1. Vehicle OFF, disconnect the X12 harness connector at the K16 Battery Energy Control Module, Vehicle in Service Mode.

8.2. Test for less than 1 V between the high voltage fault signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K16 Battery Energy Control Module.

⇓ **If between 4.8–5.2 V**

9. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down. Disconnect the X12 harness connector at the K16 Battery Energy Control Module.
10. Test for less than 2 Ω in each serial data circuit between the K112 Hybrid/EV Battery Interface Control Module and K16 Battery Energy Control Module:
    - K112 Hybrid/EV Battery Interface Control Module terminal 10 X36 and K16 Battery Energy Control Module terminal 19 X12
    - K112 Hybrid/EV Battery Interface Control Module terminal 11 X36 and K16 Battery Energy Control Module terminal 18 X12

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the K112 Hybrid/EV Battery Interface Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

Symptoms - Data Communications

Note: The following steps must be completed before using the symptom tables.

1. Perform the *Diagnostic System Check - Vehicle on page 6-91* before using the symptom tables in order to verify that all of the following are true:
   - There are no Diagnostic Trouble Codes (DTC) set.
   - The devices can communicate via the serial data links.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to *Data Link Communications Description and Operation on page 11-237*.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the systems. Refer to *Checking Aftermarket Accessories on page 11-871*.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- *Scan Tool Does Not Power Up on page 11-218*
- *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224*
- *Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229*

Scan Tool Does Not Power Up

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Data Link Connector B+	1	1	—	—
Data Link Connector Ground	—	1	—	—
1. Scan Tool Does Not Power Up				

Circuit/System Description

The data link connector (DLC) is a standardized 16 cavity connector. Connector design and location is dictated by an industry wide standard, and is required to provide the following:

- Scan tool B+ voltage at terminal 16
- Scan tool ground at terminal 4
- Common ground at terminal 5

Diagnostic Aids

- The scan tool will power up with the vehicle OFF. Some devices however, will not communicate unless the vehicle is ON and the power mode master device sends the appropriate power mode message.
- If the B+ circuit, ground circuits, and connections of the data link connector are functioning properly, the malfunction must be due to the scan tool.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 2 Ω between each of the X84 data link connector ground circuit terminals listed below and ground.
   - Ground circuit terminal 4
   - Ground circuit terminal 5

⇒ **If 2 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 2 Ω**

3. Vehicle in Service Mode.
4. Verify a test lamp illuminates between the B+ circuit terminal 16 at the X84 data link connector and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ **If the test lamp illuminates**

5. Refer to the scan tool user guide.

Scan Tool Does Not Communicate with Chassis High Speed GMLAN Device

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Chassis High Speed GMLAN Serial Data (+)	1	U0100–U02FF*	1	—
Chassis High Speed GMLAN Serial Data (−)	1	U0100–U02FF*	1	—
Ground (DLC, terminal 5)	—	1	—	—

* No communications with one or more chassis high speed GMLAN devices. An open in only one chassis high speed GMLAN serial data circuit may allow degraded communication between the devices. An open between the data link connector (DLC) and the first splice/device will only affect the communication with the scan tool. The devices will still communicate.

1. No communication with any chassis high speed GMLAN device.

Circuit/System Description

The chassis high speed GMLAN bus functions the same as the primary high speed GMLAN bus, and the two buses operate in parallel. The chassis high speed GMLAN bus is added to reduce message congestion on the primary high speed bus. Since the chassis high speed GMLAN bus and primary high speed GMLAN bus operate in the same manner, the diagnostics for each are the same.

The serial data is transmitted on two twisted wires that allow speeds up to 500 Kb/s. The twisted pair is terminated with two 120 Ω resistors, one is internal to the electronic brake control module and the other can be a separate resistor in a connector assembly or in another device. The resistors are used as the load for the chassis high speed GMLAN bus during normal vehicle operation. The chassis high speed GMLAN is a differential bus. The chassis high speed GMLAN serial data bus (+) and chassis high speed GMLAN serial data (−) are driven to opposite extremes from a rest or idle level of approximately 2.5 V. Driving the lines to their extremes, adds 1 V to the chassis high speed GMLAN serial data bus (+) circuit and subtracts 1 V from the chassis high speed GMLAN serial data bus (−) circuit. If serial data is lost, devices will set a no communication code against the non-communicating device. Note that a loss of serial data DTC does not represent a failure of the device that set it.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status.
  Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis.
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between some devices and the scan tool with one or more GMLAN serial data systems inoperative. This condition is due to those devices using multiple serial data communication systems.
- An open in the DLC ground circuit terminal 5 will allow the scan tool to operate but not communicate with the vehicle.
- Technicians may find various Local Area Network (LAN) communication Diagnostic Trouble Codes (DTC).

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify two or more devices are not communicating on the chassis high speed GMLAN serial data circuit. Refer to *Data Link References on page 11-232* to determine how many devices should be communicating on the bus.

⇒ **If only one device is not communicating**

Refer to Circuit/System Testing – Testing the Device Circuits.

⇓ **If two or more devices are not communicating**

3. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the scan tool from the X84 data link connector. The following tests will be done at the X84 data link connector. It may take up to 2 minutes for all vehicle systems to power down.

4. Test for less than 10 Ω between the ground circuit terminal 5 and ground.

⇒ **If 10 Ω or greater**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

5. Vehicle in Service Mode.
6. Test for less than 4.5 V between the serial data circuits listed below and ground.
   - Terminal 12
   - Terminal 13

⇒ **If 4.5 V or greater**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short to Voltage.

⇓ **If less than 4.5 V**

7. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
8. Test for greater than 100 Ω between the serial data circuits listed below and ground.
   - Terminal 12
   - Terminal 13

⇒ **If 100 Ω or less**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short to Ground.

⇓ **If greater than 100 Ω**

9. Test for 50–70 Ω between the serial data circuit terminals 12 and 13.

⇒ **If less than 35 Ω**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short between the Circuits.

⇒ **If between 35–50 Ω**

There may be a third terminating resistor between the serial data circuits. This can happen if the incorrect device is installed. Some devices are available with and without the terminating resistors installed to reduce the need of terminating resistors in the wiring harness. Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short between the Circuits.

⇒ **If greater than 70 Ω but less than infinite**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for an Open/High Resistance.

⇒ **If infinite resistance**

Repair the open/high resistance in the circuit between the X84 data link connector and the first splice/device in the serial data circuit.

⇓ **If between 50–70 Ω**

10. Refer to Circuit/System Testing – Testing the Device Circuits.

Circuit/System Testing

Note: Some devices with an internal terminating resistor have a loop in the harness that connects the internal terminating resistor to the serial data circuit. When wired this way, test these loop circuits for the appropriate failure mode short to voltage, short to ground, or open/high resistance prior to replacing the device for each of the following tests.

Each device may need to be disconnected to isolate a circuit fault. Use the schematics and connector end views to identify the following:

- Chassis high speed GMLAN devices the vehicle is equipped with
- Chassis high speed GMLAN serial data circuit terminating resistors
- Device locations on the chassis high speed GMLAN serial data circuits
- Each device's ground, B+, ignition, and chassis high speed GMLAN serial data circuit terminals

Testing the Serial Data Circuits for a Short to Voltage

1. Vehicle OFF, disconnect the harness connectors with the chassis high speed GMLAN serial data circuits at an easily accessible device, Vehicle in Service Mode.
2. Test for greater than 4.5 V between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If each serial data circuit is 4.5 V or less**

2.1. Vehicle OFF.

2.2. Test for less than 10 Ω between each of the device's ground circuit terminals and ground.

⇒ If 10 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 10 Ω, replace the device that was disconnected.

⇓ **If any serial data circuit is greater than 4.5 V**

3. Vehicle OFF, disconnect the harness connectors with the chassis high speed GMLAN serial data circuits at another device, in the direction of the circuit shorted to voltage, Vehicle in Service Mode.

4. Test for greater than 4.5 V between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If each serial data circuit is 4.5 V or less**

4.1. Vehicle OFF.

4.2. Test for less than 10 Ω between each of the device's ground circuit terminals and ground.

⇒ If 10 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 10 Ω, replace the device that was disconnected.

⇓ **If any serial data circuit is greater than 4.5 V**

5. Repeat step 3 until one of the following conditions are isolated:
   - A short to voltage on the serial data circuit between two devices or splice packs, if equipped.
   - A short to voltage on the serial data circuit between a device and a terminating resistor.

Testing the Serial Data Circuits for a Short to Ground

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Disconnect the harness connectors with the chassis high speed GMLAN serial data circuits at an easily accessible device.
3. Test for greater than 100 Ω between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If each serial data circuit is 100 Ω or greater**

Replace the device that was disconnected.

⇓ **If any serial data circuit is less than 100 Ω**

4. Disconnect the harness connectors with the chassis high speed GMLAN serial data circuits at another device, in the direction of the circuit shorted to ground.
5. Test for greater than 100 Ω between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If both serial data circuits are 100 Ω or greater**

Replace the device that was disconnected.

⇓ **If any serial data circuit is less than 100 Ω**

6. Repeat step 4 until one of the following conditions are isolated:
   - A short to ground on the serial data circuit between two devices or splice packs, if equipped.
   - A short to ground on the serial data circuit between a device and a terminating resistor.
   - A short to ground on the serial data circuit between the X84 data link connector and the first device or splice pack.

Testing the Serial Data Circuits for a Short between the Circuits

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Disconnect the harness connectors with the chassis high speed GMLAN serial data circuits at an easily accessible device that is not communicating.
3. Test for greater than 110 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 110 Ω or greater**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is less than 110 Ω**

4. Connect the harness connectors at the device that was disconnected.
5. Disconnect the harness connectors with the chassis high speed GMLAN serial data circuits at another device, in the direction of the circuit shorted together.
6. Test for greater than 110 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 110 Ω or greater**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is less than 110 Ω**

7. Repeat step 4 until one of the following conditions are isolated:
   - Serial data circuits shorted together between two devices or splice packs, if equipped.
   - Serial data circuits shorted together between a device and a terminating resistor.
   - Serial data circuits shorted together between the X84 data link connector and the first device or splice pack.
   - A shorted terminating resistor.

Testing the Serial Data Circuits for an Open/High Resistance

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Disconnect the harness connectors with the chassis high speed GMLAN serial data circuits at an easily accessible device that is not communicating.
3. Test for less than 130 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuit is 130 Ω or less**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is greater than 130 Ω**

4. Connect the harness connectors at the device that was disconnected.
5. Disconnect the harness connectors with the chassis high speed GMLAN serial data circuits at another device, in the direction of the circuit with the open/high resistance.
6. Test for less than 130 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 130 Ω or less**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is greater than 130 Ω**

7. Repeat step 4 until one of the following conditions are isolated:
   - An open/high resistance on the serial data circuit between two devices or splice packs, if equipped.
   - An open/high resistance on the serial data circuit between a device and a terminating resistor.
   - An open/high resistance terminating resistor.

Testing the Device Circuits

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Disconnect the harness connectors at an easily accessible device that is not communicating.
3. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

3.1. Vehicle OFF.

3.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

4. Vehicle in Service Mode
5. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

5.1. Vehicle OFF.

5.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

5.1. Vehicle OFF.

5.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the disconnected device.

⇓ **If the test lamp illuminates**

6. Vehicle in Service Mode.
7. If equipped, verify a test lamp illuminates between each ignition circuit terminal, which has a fuse in the circuit, and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

7.1. Vehicle OFF.

7.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

7.1. Vehicle OFF.

7.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the disconnected device.

⇓ **If the test lamp illuminates**

8. Vehicle in Service Mode
9. If equipped, verify a test lamp illuminates between each ignition circuit terminal, which is controlled by a control module, and ground.

⇒ **If the test lamp does not illuminate**

9.1. Vehicle OFF, disconnect the harness connectors at the control module that controls the ignition circuit.

9.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

9.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the control module that controls the ignition circuit.

⇓ **If the test lamp illuminates**

10. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
11. Test for less than 130 Ω between each pair of chassis high speed GMLAN serial data circuits at the device connector that was just disconnected.

⇒ **If any pair of serial data circuits is greater than 130 Ω**

Repair the open/high resistance in the serial data circuits between the disconnected device and the circuit splice in the serial data circuits.

⇓ **If each pair of serial data circuits is 130 Ω or less**

12. Replace the device that was disconnected.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

Scan Tool Does Not Communicate with High Speed GMLAN Device

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
High Speed GMLAN Serial Data (+)	1	U0100–U02FF*	1	—
High Speed GMLAN Serial Data (−)	1	U0100–U02FF*	1	—
Ground (DLC, terminal 5)	—	1	—	—

* No communications with one or more high speed GMLAN devices. An open in only one high speed GMLAN serial data circuit may allow degraded communication between the devices. An open between the data link connector (DLC) and the first splice/device will only affect the communication with the scan tool. The devices will still communicate.

1. No communication with any high speed GMLAN device

Circuit/System Description

The serial data is transmitted on two twisted wires that allow speeds up to 500 Kb/s. The twisted pair is terminated with two 120 Ω resistors, one is internal to the engine control module (ECM) and the other can be a separate resistor in a connector assembly or in another device. The resistors are used as the load for the High Speed GMLAN bus during normal vehicle operation. The high speed GMLAN is a differential bus. The high speed GMLAN serial data bus (+) and high speed GMLAN serial data (−) are driven to opposite extremes from a rest or idle level of approximately 2.5 V. Driving the lines to their extremes, adds 1 V to the high speed GMLAN serial data bus (+) circuit and subtracts 1 V from the high speed GMLAN serial data bus (−) circuit. If serial data is lost, devices will set a no communication code against the non-communicating device. Note that a loss of serial data DTC does not represent a failure of the device that set it.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U-code present. However, there is no associated "current" or "active" status.
  Loss-of-communication U-codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  – A device on the data communication circuit was disconnected while the communication circuit is awake.
  – Power to one or more devices was interrupted during diagnosis.

  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss-of-communication U-code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between some devices and the scan tool with the high speed GMLAN serial data system inoperative. This condition is due to those devices using multiple serial data communication systems.
- An open in the DLC ground circuit terminal 5 will allow the scan tool to operate but not communicate with the vehicle.
- The engine will not start when there is a total malfunction of the high speed GMLAN serial data bus.
- Technicians may find various Local Area Network (LAN) communication Diagnostic Trouble Codes (DTC) and no low speed GMLAN communications with the scan tool.
- These conditions may be caused by the installation of an aftermarket navigation radio module (see bulletins). Some customers may comment of one or more of the following concerns:
  - Vehicle will not crank
  - Vehicle cranks but will not start
  - Vehicle stability enhancement system warning lights and messages
  - PRNDL gear indicator position errors

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify two or more devices are not communicating on the high speed GMLAN serial data circuit. Refer to *Data Link References on page 11-232* to determine how many devices should be communicating on the bus.

⇒ **If only one device is not communicating**

Refer to Circuit/System Testing – Testing the Device Circuits.

⇓ **If two or more devices are not communicating**

3. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. Disconnect the scan tool from the X84 data link connector. The following tests will be done at the X84 data link connector. It may take up to 2 minutes for all vehicle systems to power down.
4. Test for less than 10 Ω between the ground circuit terminal 5 and ground.

⇒ **If 10 Ω or greater**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

5. Vehicle in Service Mode.
6. Test for less than 4.5 V between the serial data circuits listed below and ground.
   - Terminal 6
   - Terminal 14

⇒ **If 4.5 V or greater**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short to Voltage.

⇓ **If less than 4.5 V**

7. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
8. Test for greater than 100 Ω between the serial data circuits listed below and ground.
   - Terminal 6
   - Terminal 14

⇒ **If 100 Ω or less**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short to Ground.

⇓ **If greater than 100 Ω**

9. Test for 50–70 Ω between the serial data circuit terminals 6 and 14.

⇒ **If less than 35 Ω**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short between the Circuits.

⇒ **If between 35–50 Ω**

There may be a third terminating resistor between the serial data circuits. This can happen if the incorrect device is installed. Some devices are available with and without the terminating resistors installed to reduce the need of terminating resistors in the wiring harness. Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short between the Circuits.

⇒ **If greater than 70 Ω but less than infinite**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for an Open/High Resistance.

⇒ **If infinite resistance**

Repair the open/high resistance in the circuit between the X84 data link connector and the first splice/device in the serial data circuit.

⇓ **If between 50–70 Ω**

10. Refer to Circuit/System Testing – Testing the Device Circuits.

Circuit/System Testing

Note: Some devices with an internal terminating resistor have a loop in the harness that connects the internal terminating resistor to the serial data circuit. When wired this way, test these loop circuits for the appropriate failure mode short to voltage, short to ground, or open/high resistance prior to replacing the device for each of the following tests.

Each device may need to be disconnected to isolate a circuit fault. Use the schematics and connector end views to identify the following:

- High speed GMLAN devices the vehicle is equipped with
- High speed GMLAN serial data circuit terminating resistors
- Device locations on the high speed GMLAN serial data circuits
- Each device's ground, B+, ignition, and high speed GMLAN serial data circuit terminals

Testing the Serial Data Circuits for a Short to Voltage

1. Vehicle OFF, disconnect the harness connectors with the high speed GMLAN serial data circuits at an easily accessible device, Vehicle in Service Mode.
2. Test for greater than 4.5 V between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If each serial data circuit is 4.5 V or less**

2.1. Vehicle OFF.

2.2. Test for less than 10 Ω between each of the device's ground circuit terminals and ground.

⇒ If 10 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 10 Ω, replace the device that was disconnected.

⇓ **If any serial data circuit is greater than 4.5 V**

3. Vehicle OFF, disconnect the harness connectors with the high speed GMLAN serial data circuits at another device, in the direction of the circuit shorted to voltage, Vehicle in Service Mode.
4. Test for greater than 4.5 V between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If each serial data circuit is 4.5 V or less**

4.1. Vehicle OFF.

4.2. Test for less than 10 Ω between each of the device's ground circuit terminals and ground.

⇒ If 10 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 10 Ω, replace the device that was disconnected.

⇓ **If any serial data circuit is greater than 4.5 V**

5. Repeat step 3 until one of the following conditions are isolated:
   - A short to voltage on the serial data circuit between two devices or splice packs, if equipped.
   - A short to voltage on the serial data circuit between a device and a terminating resistor.

Testing the Serial Data Circuits for a Short to Ground

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Disconnect the harness connectors with the high speed GMLAN serial data circuits at an easily accessible device.
3. Test for greater than 100 Ω between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If each serial data circuit is 100 Ω or greater**

Replace the device that was disconnected.

⇓ **If any serial data circuit is less than 100 Ω**

4. Disconnect the harness connectors with the high speed GMLAN serial data circuits at another device, in the direction of the circuit shorted to ground.

5. Test for greater than 100 Ω between each serial data circuit at the device connector that was just disconnected and ground.

⇒ **If both serial data circuits are 100 Ω or greater**

Replace the device that was disconnected.

⇓ **If any serial data circuit is less than 100 Ω**

6. Repeat step 4 until one of the following conditions are isolated:
   - A short to ground on the serial data circuit between two devices or splice packs, if equipped.
   - A short to ground on the serial data circuit between a device and a terminating resistor.
   - A short to ground on the serial data circuit between the X84 data link connector and the first device or splice pack.

Testing the Serial Data Circuits for a Short between the Circuits

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Disconnect the harness connectors with the high speed GMLAN serial data circuits at an easily accessible device that is not communicating.
3. Test for greater than 110 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 110 Ω or greater**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is less than 110 Ω**

4. Connect the harness connectors at the device that was disconnected.
5. Disconnect the harness connectors with the high speed GMLAN serial data circuits at another device, in the direction of the circuit shorted together.
6. Test for greater than 110 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 110 Ω or greater**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is less than 110 Ω**

7. Repeat step 4 until one of the following conditions are isolated:
   - Serial data circuits shorted together between two devices or splice packs, if equipped.
   - Serial data circuits shorted together between a device and a terminating resistor.
   - Serial data circuits shorted together between the X84 data link connector and the first device or splice pack.
   - A shorted terminating resistor.

Testing the Serial Data Circuits for an Open/High Resistance

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Disconnect the harness connectors with the high speed GMLAN serial data circuits at an easily accessible device that is not communicating.
3. Test for less than 130 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 130 Ω or less**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is greater than 130 Ω**

4. Connect the harness connectors at the device that was disconnected.
5. Disconnect the harness connectors with the high speed GMLAN serial data circuits at another device, in the direction of the circuit with the open/high resistance.
6. Test for less than 130 Ω between each pair of serial data circuits at the device connector that was just disconnected.

⇒ **If each pair of serial data circuits is 130 Ω or less**

Replace the device that was disconnected.

⇓ **If any pair of serial data circuits is greater than 130 Ω**

7. Repeat step 4 until one of the following conditions are isolated:
   - An open/high resistance on the serial data circuit between two devices or splice packs, if equipped.
   - An open/high resistance on the serial data circuit between a device and a terminating resistor.
   - An open/high resistance terminating resistor.

Testing the Device Circuits

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
2. Disconnect the harness connectors at an easily accessible device that is not communicating.
3. Test for less than 10 Ω between each ground circuit terminal and ground.

⇒ **If 10 Ω or greater**

3.1. Vehicle OFF.

3.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

4. Vehicle in Service Mode
5. If equipped, verify a test lamp illuminates between each B+ circuit terminal and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

5.1. Vehicle OFF.

5.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

5.1. Vehicle OFF.

5.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the disconnected device.

⇓ **If the test lamp illuminates**

6. Vehicle in Service Mode.
7. If equipped, verify a test lamp illuminates between each ignition circuit terminal, which has a fuse in the circuit, and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

7.1. Vehicle OFF.

7.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

7.1. Vehicle OFF.

7.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the disconnected device.

⇓ **If the test lamp illuminates**

8. Vehicle in Service Mode
9. If equipped, verify a test lamp illuminates between each ignition circuit terminal, which is controlled by a control module, and ground.

⇒ **If the test lamp does not illuminate**

9.1. Vehicle OFF, disconnect the harness connectors at the control module that controls the ignition circuit.

9.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

9.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the control module that controls the ignition circuit.

⇓ **If the test lamp illuminates**

10. Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 meters (9.8 feet) away from vehicle. It may take up to 2 minutes for all vehicle systems to power down.
11. Test for less than 130 Ω between each pair of high speed GMLAN serial data circuits at the device connector that was just disconnected.

⇒ **If any pair of serial data circuits is greater than 130 Ω**

Repair the open/high resistance in the serial data circuits between the disconnected device and the circuit splice in the serial data circuits.

⇓ **If each pair of serial data circuits is 130 Ω or less**

12. Replace the device that was disconnected.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

Scan Tool Does Not Communicate with Low Speed GMLAN Device

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Low Speed GMLAN Serial Data	1	U0100-U02FF*	1	—
Ground (DLC, terminal 5)	—	1*	—	—
* An open between the Data Link Connector (DLC) and the first splice pack/device will only affect the communication with the scan tool. 1. No communication with any low speed GMLAN device				

Circuit/System Description

The serial data is transmitted over a single wire to the appropriate devices. The transmission speed for GMLAN low speed is up to 83.33 Kbit/s. Under normal vehicle operating conditions, the speed of the bus is 33.33 Kbit/s. The devices toggle the serial data circuit between 0–5 V during normal communications. To wake the devices connected to the low speed GMLAN serial data circuit, a voltage wake up pulse of 10 V is sent out. If serial data is lost, devices will set a no communication code against the non-communicating device. A loss of serial data communications DTC does not represent a failure of the device that set it.

Diagnostic Aids

- Sometimes, while diagnosing a specific customer concern or after a repair, you may notice a history U code present. However, there is no associated "current" or "active" status. Loss of communication U codes such as these can set for a variety of reasons. Many times, they are transparent to the vehicle operator and technician, and/or have no associated symptoms. Eventually, they will erase themselves automatically after a number of fault-free ignition cycles. This condition would most likely be attributed to one of these scenarios:
  - A device on the data communication circuit was disconnected while the communication circuit is awake.
  - Power to one or more devices was interrupted during diagnosis
  - A low battery condition was present, so some devices stop communicating when battery voltage drops below a certain threshold.
  - Battery power was restored to the vehicle and devices on the communication circuit did not all re-initialize at the same time.
  - If a loss of communication U code appears in history for no apparent reason, it is most likely associated with one of the scenarios above. These are all temporary conditions and should never be interpreted as an intermittent fault, causing you to replace a part.
- Do not replace a device reporting a U code. The U code identifies which device needs to be diagnosed for a communication issue.
- Communication may be available between the device and the scan tool with the low speed GMLAN serial data system inoperative. This condition is due to the device using both the high and low speed GMLAN systems.
- An open in the low speed GMLAN serial data circuit between the splice pack and a device will only affect that specific device. This type of failure will set a loss of communication DTC for each device affected, and the other devices will still communicate.
- An open in the Data Link Connector ground circuit terminal 5 will allow the scan tool to operate but not communicate with the vehicle.
- The engine may not start when there is a total malfunction of the low speed GMLAN serial data circuit.
- Technicians may find various Local Area Network (LAN) communication Diagnostic Trouble Codes (DTC) and no low speed LAN communications with the scan tool.
- These conditions may be caused by the installation of an aftermarket navigation radio device (see bulletins). Some customers may comment of one or more of the following concerns:
  - Vehicle will not crank
  - Vehicle cranks but will not start
  - Vehicle stability enhancement system warning lights and messages
  - PRNDL gear indicator position errors

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Control Module References on page 6-3*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Data Link Communications Description and Operation on page 11-237

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note: Use the schematic to identify the following:

- Devices the vehicle is equipped with
- Device and splice pack locations on the low speed GMLAN serial data circuit
- The low speed GMLAN serial data circuit terminals for each device or splice pack

1. Attempt to communicate with all devices on the low speed GMLAN serial data circuit. Refer to *Data Link References on page 11-232*.
2. Verify which devices are communicating on the low speed GMLAN serial data circuit.

⇒ **If only one device is not communicating**

Diagnose that device only. Refer to *DTC U0100-U02FF on page 11-81*.

⇒ **If one or more devices are communicating but not all**

Refer to Circuit/System Testing – Testing the Serial Data Circuit for an Open/High Resistance.

⇓ **If none of the devices are communicating**

3. Vehicle OFF, all access doors closed, all vehicle systems OFF, all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down. Disconnect the scan tool from the X84 Data Link Connector. The following tests will be done at the X84 Data Link Connector.
4. Test for less than 10 Ω between the ground circuit terminal 5 and ground.

⇒ **If 10 Ω or greater**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

5. Vehicle in Service Mode.
6. Test for less than 4.5 V between the serial data circuit terminal 1 and ground.

⇒ **If 4.5 V or greater**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short to Voltage.

⇓ **If less than 4.5 V**

7. Vehicle OFF, all access doors closed, all vehicle systems OFF, all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down.
8. Test for greater than 100 Ω between the serial data circuit terminal 1 and ground.

⇒ **If 100 Ω or less**

Refer to Circuit/System Testing – Testing the Serial Data Circuits for a Short to Ground.

⇓ **If greater than 100 Ω**

9. Disconnect the appropriate harness connector at the first splice pack closest in the circuit to the X84 Data Link Connector.
10. Test for less than 2 Ω between the X84 Data Link Connector's serial data circuit terminal 1 and the splice pack harness connector's serial data input terminal.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

11. Replace the splice pack.

Circuit/System Testing

Testing the Serial Data Circuits for a Short to Voltage

1. Vehicle OFF, disconnect the appropriate harness connectors at all low speed GMLAN serial data splice packs, Vehicle in Service Mode.
2. Test for less than 4.5 V between the serial data circuit terminal 1 at the X84 Data Link Connector and ground.

⇒ **If 4.5 V or greater**

Repair the short to voltage on the serial data circuit.

⇓ **If less than 4.5 V**

3. Test for less than 4.5 V between each low speed GMLAN serial data circuit at a splice pack and ground.

⇒ **If any serial data circuit is greater than 4.5 V**

3.1. Vehicle OFF, disconnect all devices on the failed serial data circuit, Vehicle in Service Mode.

3.2. Test for less than 1 V between each section of the failed serial data circuit and ground.

⇒ If 1 V or greater, repair the short to voltage in the circuit.

⇓ If less than 1 V

3.3. Vehicle OFF, connect the splice pack and connect the first device on the failed serial data circuit, Vehicle in Service Mode.

3.4. Verify the scan tool communicates or not with the low speed GMLAN serial data circuit.

⇒ If the scan tool does not communicate, replace the device that was just connected.

⇒ If the scan tool communicates and there are more devices to connect, connect the next device and repeat step 3.4.

⇓ If the scan tool communicates and there are no more devices to connect

3.5. All OK.

⇓ **If all serial data circuits are less than 4.5 V**

4. All OK.

Testing the Serial Data Circuits for a Short to Ground

1. Vehicle OFF, all access doors closed, all vehicle systems OFF, all keys at least 3 m (9.8 ft) away from vehicle. It may take up to 2 min for all vehicle systems to power down. Disconnect the appropriate harness connectors at all low speed GMLAN serial data splice packs.
2. Test for infinite resistance between the serial data circuit terminal 1 at the X84 Data Link Connector and ground.

⇒ **If less than infinite resistance**

Repair the short to ground on the serial data circuit.

⇓ **If infinite resistance**

3. Test for greater than 100 Ω between each low speed GMLAN serial data circuit at a splice pack and ground.

⇒ **If any serial data circuit is 100 Ω or less**

3.1. Disconnect all devices on the failed serial data circuit.

3.2. Test for infinite resistance between each section of the failed serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground in the circuit.

⇓ If infinite resistance

3.3. Connect the splice pack and connect the first device on the failed serial data circuit, Vehicle in Service Mode.

3.4. Verify the scan tool communicates or not with the low speed GMLAN serial data circuit.

⇒ If the scan tool does not communicate, replace the device that was just connected.

⇒ If the scan tool communicates and there are more devices to connect, connect the next device and repeat step 3.4.

⇓ If the scan tool communicates and there are no more devices to connect

3.5. All OK.

⇓ **If all serial data circuits are greater than 100 Ω**

4. All OK.

Testing the Serial Data Circuit for an Open/High Resistance

1. Vehicle OFF and all vehicle systems OFF, disconnect the splice pack containing the devices that are not communicating on the low speed GMLAN serial data circuit.
2. Test for less than 2 Ω between the X84 Data Link Connector terminal 1 and the disconnected splice pack.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

3. Disconnect all devices on the failed serial data circuit.
4. Test for less than 2 Ω between each section of the failed serial data circuit end to end.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the serial data circuit.

⇓ **If less than 2 Ω**

5. Connect the splice pack and connect the first device on the failed serial data circuit, Vehicle in Service Mode.
6. Verify if the device communicates or not with the scan tool.

⇒ **If the device does not communicates**

Replace the device.

⇒ **If the device communicates and there are more devices to connect**

Connect the next device on the failed serial data circuit and repeat step 6.

⇓ **If all devices are connected and communicating**

7. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *Control Module References on page 6-3* for device replacement, programming and setup

Data Link References

This table identifies which serial data link that a particular module uses for in-vehicle data transmission. Some modules may use more than one data link to communicate. Some modules may have multiple communication circuits passing through them without actively communicating on that data link. This table is used to assist in correcting a communication malfunction. For the description and operation of these serial data communication circuits refer to *Data Link Communications Description and Operation on page 11-237*.

Data Link References

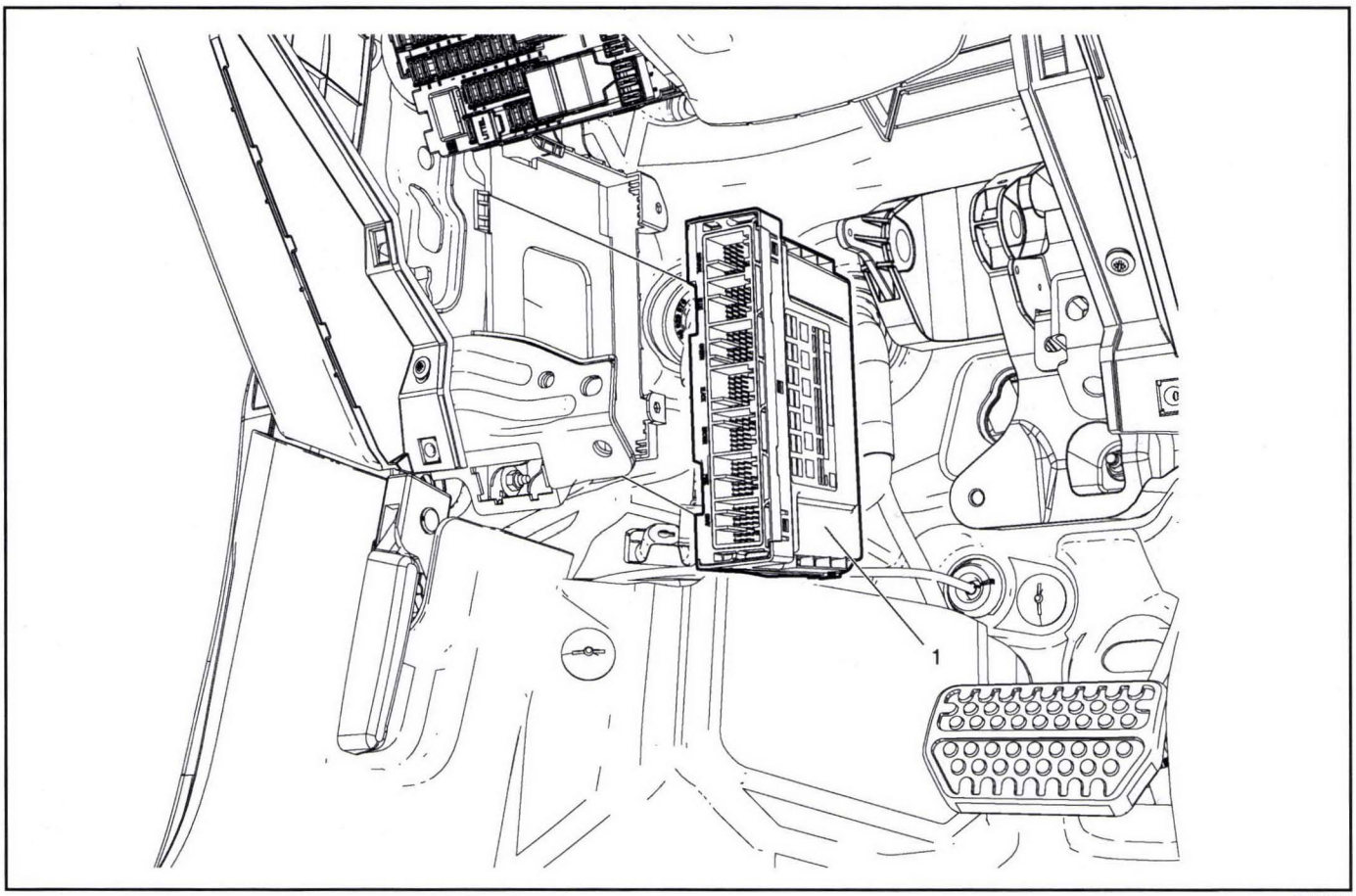
Code	Device	Data Link Type	Diagnostic Procedure
Schematic Reference: *Data Communication Schematics on page 11-6*			
A11	Radio	Low Speed GMLAN	*Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229*
A26	HVAC Controls	Local Interconnect Network (LIN)	*DTC U1500-U15FF on page 11-88*
G1	A/C Compressor	High Speed GMLAN	*Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224*
K9	Body Control Module	• High Speed GMLAN • Low Speed GMLAN	• *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224* • *Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229*
K10	Coolant Heater Control Module	Low Speed GMLAN	*Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229*
K16	Battery Energy Control Module	• High Speed GMLAN • High Voltage Energy Management Expansion Bus • BECM Dedicated Bus	• *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224* • *DTC U007A on page 11-75* • *DTC U2401 on page 11-189*
K17	Electronic Brake Control Module	• High Speed GMLAN • Chassis Expansion Bus	• *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224* • *Scan Tool Does Not Communicate with Chassis High Speed GMLAN Device on page 11-219*
K20	Engine Control Module	• High Speed GMLAN • Powertrain Expansion Bus	• *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224* • *DTC U0074 on page 11-69*
K33	HVAC Control Module	• Low Speed GMLAN • Local Interconnect Network (LIN)	• *Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229* • *DTC U1500-U15FF on page 11-88*
K36	Inflatable Restraint Sensing and Diagnostic Module	• Low Speed GMLAN • Chassis Expansion Bus	• *Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229* • *Scan Tool Does Not Communicate with Chassis High Speed GMLAN Device on page 11-219*

Data Link References (cont'd)

Code	Device	Data Link Type	Diagnostic Procedure
Schematic Reference: *Data Communication Schematics on page 11-6*			
K43	Power Steering Control Module	High Speed GMALN	*Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224*
K73	Telematics Communication Interface Control Module	• High Speed GMALN • Low Speed GMLAN	• *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224* • *Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229*
K83	Parking Brake Control Module	High Speed GMLAN	*Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224*
K84	Keyless Entry Control Module	Low Speed GMLAN	*Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229*
K85	Passenger Presence Module	Low Speed GMLAN	*Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229*
K112	Hybrid/EV Battery Interface Control Module	BECM Dedicated Bus	*DTC U2401 on page 11-189*
K114A	Hybrid/EV Powertrain Control Module 1	• High Speed GMLAN • Chassis Expansion Bus • Powertrain Expansion Bus	• *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224* • *Scan Tool Does Not Communicate with Chassis High Speed GMLAN Device on page 11-219* • *DTC U0074 on page 11-69*
K114B	Hybrid/EV Powertrain Control Module 2	• Low Speed GMLAN • High Speed GMLAN • Powertrain Expansion Bus • High Voltage Energy Management Expansion Bus	• *Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229* • *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224* • *DTC U0074 on page 11-69* • *DTC U007A on page 11-75*
K132	Pedestrian Alert Sound Control Module	High Speed GMALN	*Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224*
P16	Instrument Cluster	Low Speed GMLAN	*Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229*
T6	Power Inverter Module	• High Speed GMLAN • Chassis Expansion Bus • Powertrain Expansion Bus	• *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224* • *Scan Tool Does Not Communicate with Chassis High Speed GMLAN Device on page 11-219* • *DTC U0074 on page 11-69*
T18	Battery Charger	• High Speed GMLAN • High Voltage Energy Management Expansion Bus	• *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224* • *DTC U007A on page 11-75*
T24	Battery Charger – DC	• High Speed GMLAN • High Voltage Energy Management Expansion Bus	• *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-224* • *DTC U007A on page 11-75*

Repair Instructions

Body Control Module Replacement

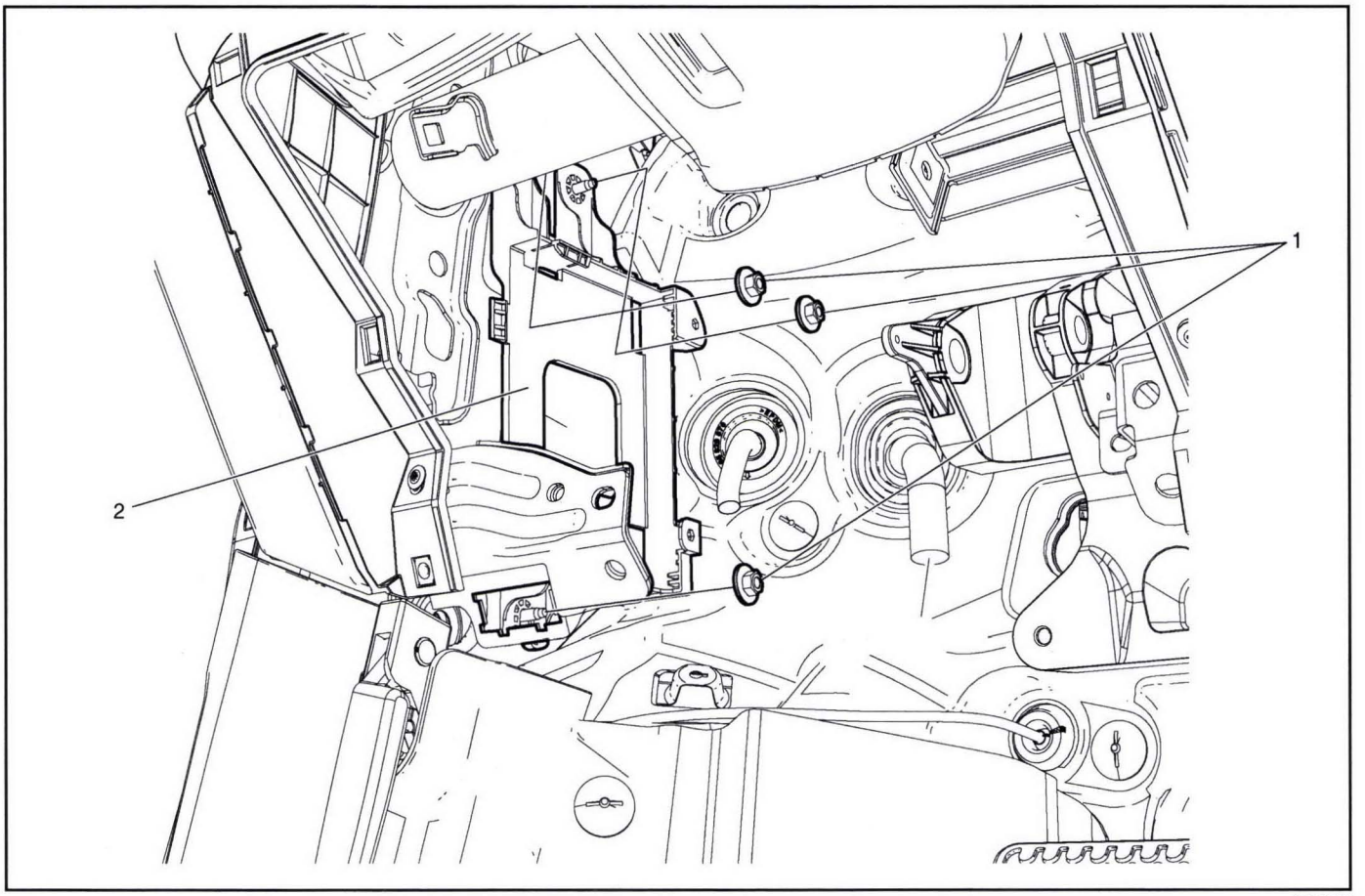


2754162

Body Control Module Replacement

Callout	Component Name
Preliminary Procedures 1. Disconnect the negative battery cable. Refer to *Battery Negative Cable Disconnection and Connection on page 9-20*. 2. Remove instrument panel airbag bracket. Refer to *Instrument Panel Lower Airbag Bracket Replacement on page 12-153*.	
1	Body Control Module **Procedure** 1. Disconnect electrical connector. 2. Unclip body control module from body control module bracket. 3. After replacement, refer to *Control Module References on page 6-3* for programming and set up procedures.

Body Control Module Bracket Replacement

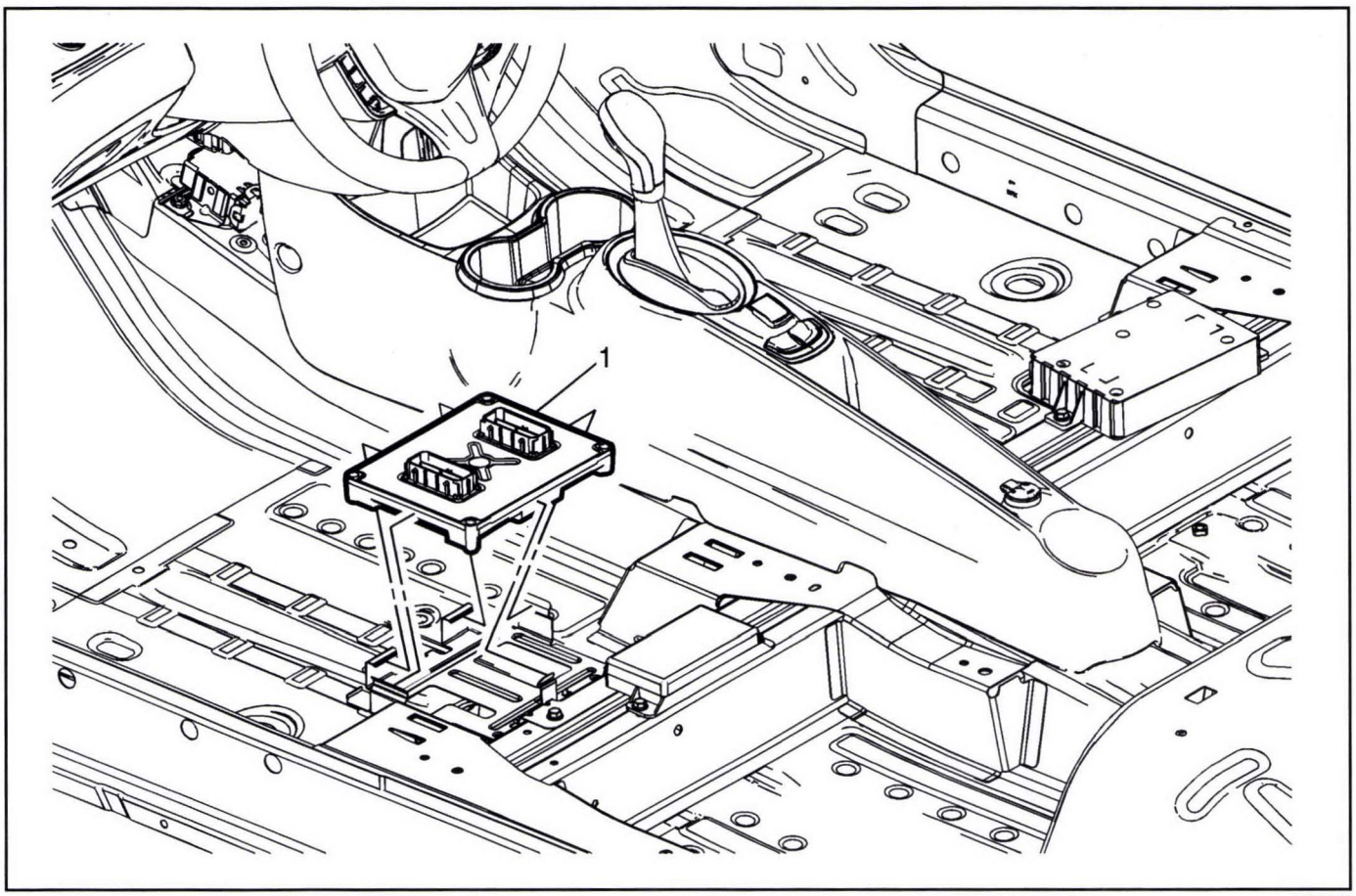


2754168

Body Control Module Bracket Replacement

Callout	Component Name
Preliminary Procedures 1. Disconnect the negative battery cable. Refer to *Battery Negative Cable Disconnection and Connection on page 9-20*. 2. Remove the body control module. Refer to *Body Control Module Replacement on page 11-234*.	
1	Body Control Module Bracket Nut (Qty: 3) **Caution:** Refer to *Fastener Caution on page 0-8*.
2	Body Control Module Bracket

Hybrid Powertrain Control Module 2 Replacement



3222690

Hybrid Powertrain Control Module 2 Replacement

Callout	Component Name
Preliminary Procedures ***Warning: Refer to Battery Disconnect Warning on page 0-4.*** 1. Disconnect the battery negative cable. 2. Remove driver front seat. Refer to *Driver or Passenger Seat Removal and Installation on page 13-3.*	
1	Hybrid Powertrain Control Module 2 **Procedure** 1. Disconnect the electrical connectors. 2. Release tabs on bracket to remove module. 3. For programming and set up, refer to *Control Module References on page 6-3.* 4. Fully charge the Hybrid Battery following all programming.

Description and Operation

Body Control System Description and Operation

The body control system consists of the body control module (BCM), communications, and various input and outputs. Some inputs, outputs and messages require other modules to interact with the BCM. The BCM also has discrete input and output terminals to control the vehicle's body functions. The BCM is wired to the high speed GMLAN serial data bus, low speed GMLAN serial data bus and Multiple LIN buses and acts as a gateway between them.

Power Mode Master

This vehicle body control module (BCM) functions as the power mode master (PMM). The ignition switch is a low current switch with multiple discrete ignition switch signals to the PMM for determining the power mode that will be sent over the serial data circuits to the other modules that need this information; the PMM will activate relays and other direct outputs of the PMM as needed. Refer to *Power Mode Description and Operation on page 11-958* for a complete description of power mode functions.

Gateway

The body control module (BCM) in this vehicle functions as a gateway or translator. The purpose of the gateway is to translate serial data messages between the GMLAN high speed bus and the GMLAN low speed bus for communication between the various modules. The gateway will interact with each network according to that network's transmission protocol.

All communication between the BCM and a scan tool is on the high speed GMLAN serial data circuits. A lost communication DTC typically is set in modules other than the module with a communication failure.

Body Control

The various body control module (BCM) input and output circuits are illustrated in the corresponding functional areas on the BCM electrical schematics. Refer to the *Body Control System Schematics on page 11-14* for more detailed information.

Data Link Communications Description and Operation

Note: This is an overview of different serial data buses used by GM devices to communicate with each others. Use *Data Communication Schematics on page 11-6* to find out which serial data buses are configured for a specific vehicle.

Circuit Description

There are many components in a vehicle that rely on information from other sources, transmit information to other sources, or both. Serial data communication networks provide a reliable, cost effective, way for various components of the vehicle to “talk” to one another and share information.

GM uses a number of different communication buses to insure the timely and efficient exchange of information between devices. When compared to each other, some of these buses are different in nature as far as speed, signal characteristics, and behavior. An example of this is the High Speed GMLAN and Low Speed GMLAN buses.

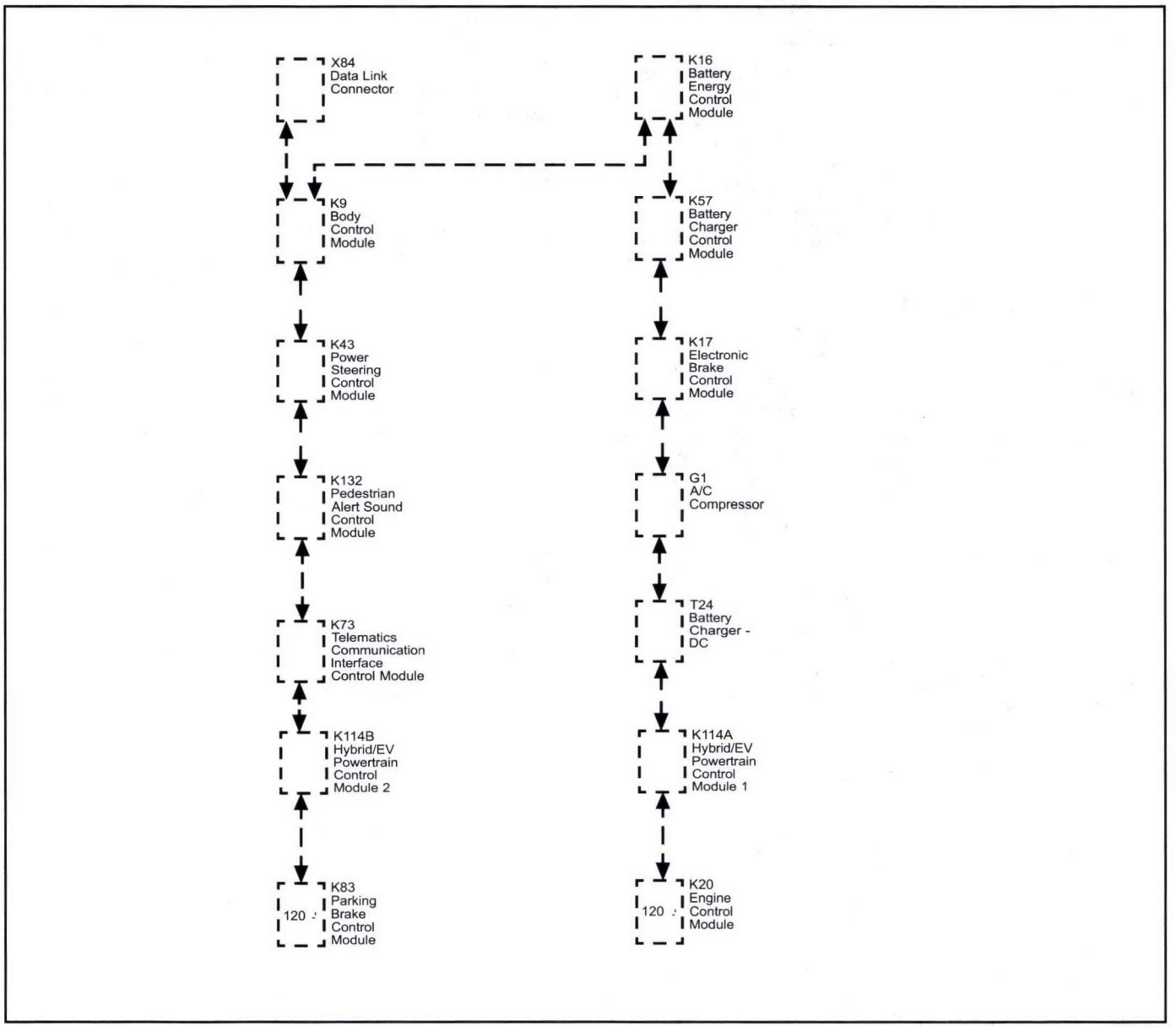
On the other hand, when other buses are compared to each other they have similar characteristics and simply operate in parallel. In this case they are used to group together components which have high interaction. Examples are the High Speed GMLAN, Powertrain Expansion, and Chassis Expansion buses. This allows them to communicate with each other on a bus with reduced message congestion insuring faster and the more timely exchange of information than if all vehicle devices were on a single bus.

The majority of information that exists within a given network generally stays local; however some information will have to be shared on other networks. Control modules designated as Gateway’s perform the function of transferring information between the various buses. A Gateway module is connected to at least 2 buses and will interact with each network according to its message strategy and transmission models.

GMLAN provides the capability for a receiving device to monitor message transmissions from other devices in order to determine if messages of interest are not being received. The primary purpose is to allow reasonable default values to be substituted for the information no longer being received. Additionally, a device may set a Diagnostic Trouble Code to indicate that the device it is expecting information from is no longer communicating.

High Speed GMLAN Circuit Description

High Speed GMLAN Block Diagram



3547294

A High Speed GMLAN Bus is used where data needs to be exchanged at a high enough rate to minimize the delay between the occurrence of a change in sensor value and the reception of this information by a control device using the information to adjust vehicle system performance.

The High Speed GMLAN serial data network consists of two twisted wires. One signal circuit is identified as GMLAN-High and the other signal circuit is identified as GMLAN-Low. At each end of the data bus there is a 120 Ω termination resistor between the GMLAN-High and GMLAN-Low circuits.

Data symbols (1's and 0's) are transmitted sequentially at a rate of 500 Kbit/s. The data to be transmitted over the bus is represented by the voltage difference between the GMLAN-High signal voltage and the GMLAN-Low signal voltage.

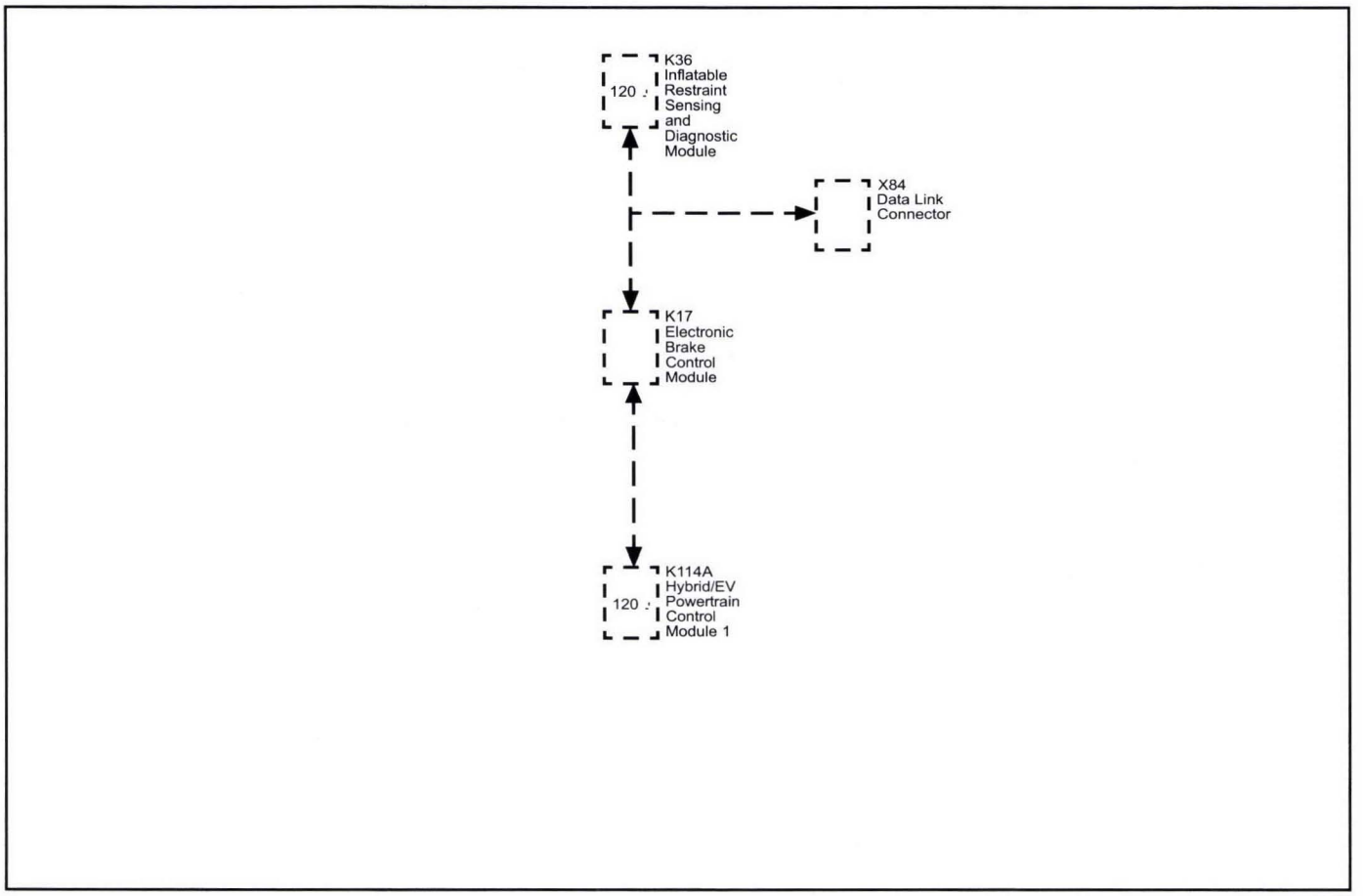
When the two wire bus is at rest the GMLAN-High and GMLAN-Low signal circuits are not being driven and this represents a logic "1". In this state both signal circuits are at the same voltage of 2.5 V. The differential voltage is approximately 0 V.

When a logic "0" is to be transmitted, the GMLAN-High signal circuit is driven higher to about 3.5 V and the GMLAN-Low circuit is driven lower to about 1.5 V. The differential voltage becomes approximately 2.0 (+/- 0.5) V.

Devices on High Speed GMLAN Bus enable or disable communication based on the voltage level of the communication enable circuit. When the circuit voltage is high (around 12 V), communications are enabled. When the circuit is low, communications are disabled.

Chassis High Speed GMLAN Circuit Description

Chassis Expansion Bus Block Diagram

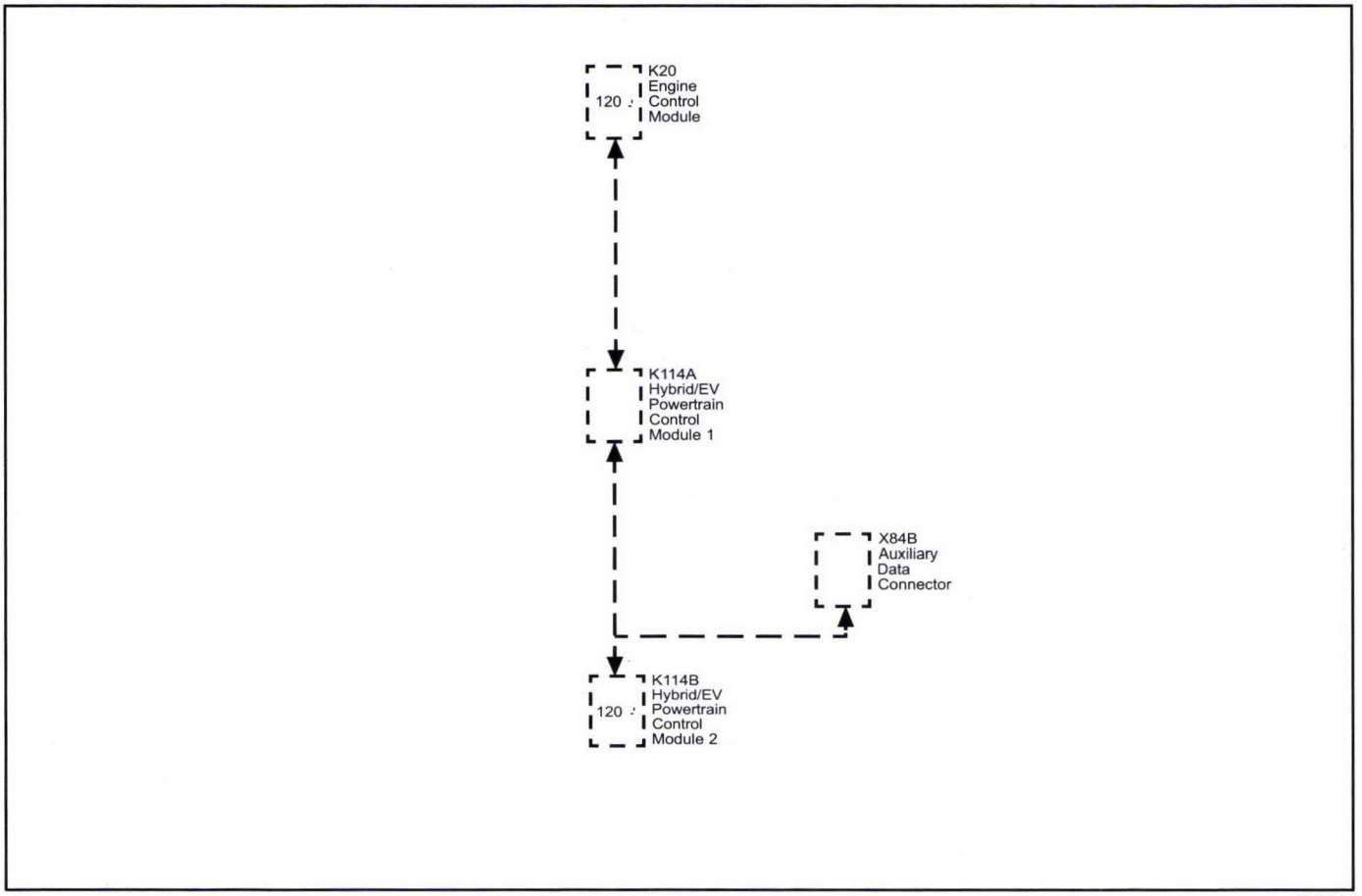


3547296

The GMLAN Chassis Expansion Bus is basically a copy of the High Speed GMLAN Bus except that its use is reserved for chassis components. This implementation splits message congestion between two parallel buses helping to insure timely message transmission and reception. Sometimes communication is required between the Chassis Expansion Bus and the primary High Speed GMLAN Bus. This is accomplished by using the K17 Electronic Brake Control Module (EBCM) as the Gateway module. Since the High Speed GMLAN Chassis Expansion Bus and primary High Speed GMLAN Bus operate in the same manner, the diagnostics for each are similar.

Powertrain High Speed GMLAN Circuit Description

Powertrain Expansion Bus Block Diagram



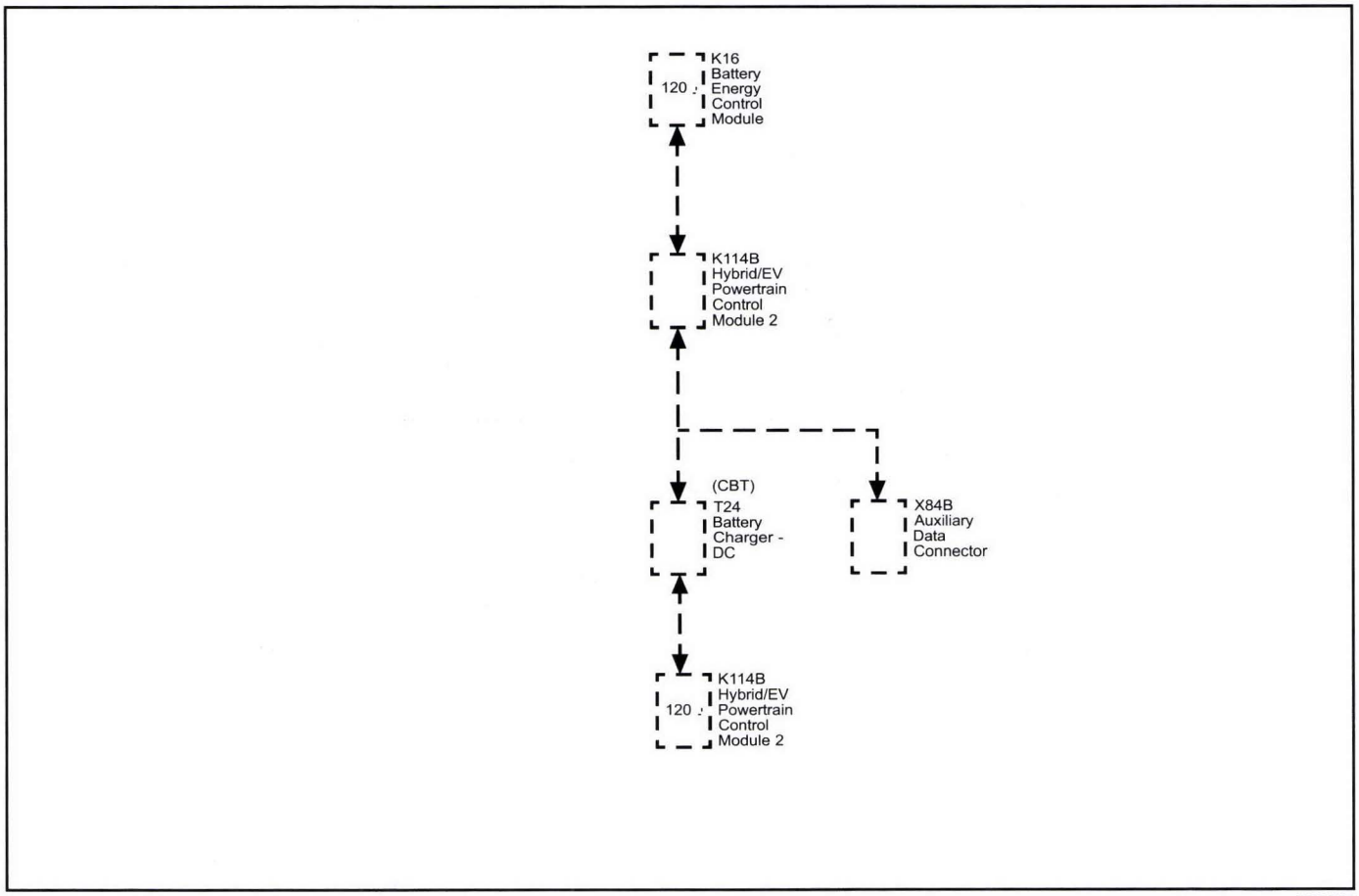
3547298

The GMLAN Powertrain Expansion Bus is basically a copy of the High Speed GMLAN Bus except that its use is reserved for Hybrid/EV Powertrain components. The bus is optional based upon feature content. Sometimes communication is required between the Powertrain Expansion Bus and the primary High Speed GMLAN Bus. This is accomplished by using the K20 Engine Control Module (ECM) as the Gateway module. Since the High Speed GMLAN Powertrain Expansion Bus and the primary High Speed GMLAN Bus operate in the same manner, the diagnostics for each are similar.

All diagnostic information is available only through the primary high speed GMLAN bus. However, Service Programming for the high speed GMLAN powertrain expansion bus is done only through the X84B Auxiliary Data Connector.

High Voltage Energy Management High Speed GMLAN Circuit Description

High Voltage Energy Management Bus Block Diagram



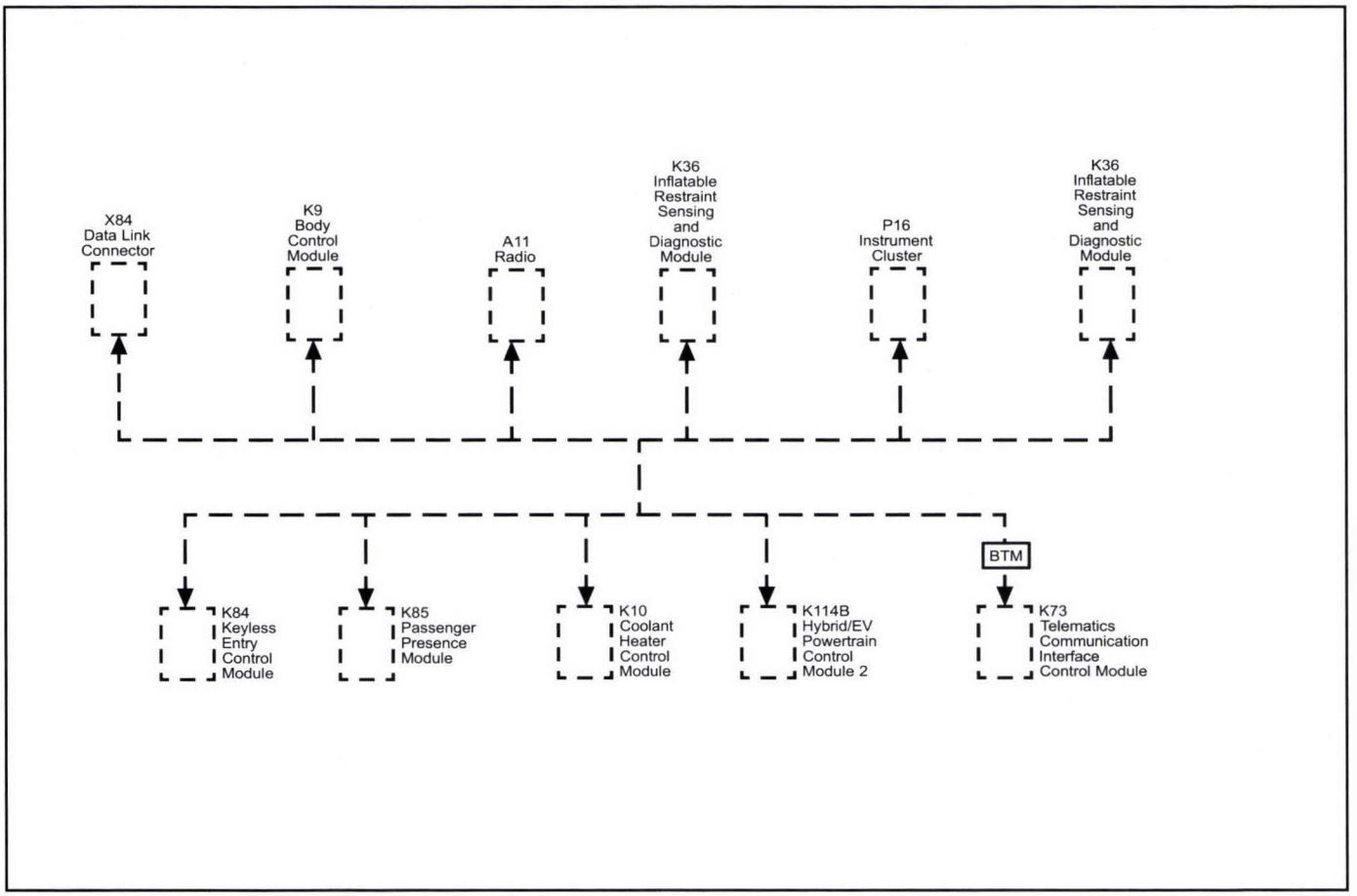
3547300

The GMLAN High Voltage Energy Management Bus is basically a copy of the High Speed GMLAN Bus except that its use is reserved for Hybrid/EV Charging components of an electric vehicle. Sometimes communication is required between the Low Speed GMLAN Bus and the High Voltage Energy Management Bus. This is accomplished by using the K114B Hybrid/EV Powertrain Control Module 2 as the Gateway module. Since the High Speed GMLAN High Voltage Energy Management Bus and primary High Speed GMLAN Bus operate in the same manner, the diagnostics for each are similar.

All diagnostic information is available only through the primary high speed GMLAN bus.

Low Speed GMLAN Circuit Description

Low Speed GMLAN Block Diagram



3547292

Low Speed GMLAN Bus is used in applications where a high data rate is not required which allows for the use of less complex components. It is typically used for operator controlled functions where the response time requirements are slower than those required for dynamic vehicle control.

The Low Speed GMLAN Serial Data Network consists of a single wire, ground referenced bus with high side voltage drive. During on road vehicle operation data symbols (1's and 0's) are transmitted sequentially at the normal rate of 33.3 Kbit/s. For component programming only, a special high speed data mode of 83.3 Kbit/s may be used.

Unlike the high speed dual wire networks, the single wire low speed network does not use terminating resistors at either end of the network.

The data symbols to be transmitted over the bus are represented by different voltage signals on the bus. When the Low Speed GMLAN Bus is at rest and is not being driven, there is a low signal voltage of approximately 0.2 V. This represents a logic "1". When a logic "0" is to be transmitted, the signal voltage is driven higher to around 4.0 V or higher.

Local Interconnect Network (LIN) Circuit Description

The Local Interconnect Network (LIN) Bus consists of a single wire with a transmission rate of 10.417 Kbit/s. This bus is used to exchange information between a master control module and other smart devices which provide supporting functionality. This type of configuration does not require the capacity or speed of either a High Speed GMLAN Bus or Low Speed GMLAN Bus and is thus relatively simpler.

The data symbols (1's and 0's) to be transmitted are represented by different voltage levels on the communication bus. When the LIN Bus is at rest and is not being driven, the signal is in a high voltage state of approximately Vbatt. This represents a logic "1". When a logic "0" is to be transmitted, the signal voltage is driven low to about ground (0.0 V).

Data Link Connector (DLC)

The X84 Data Link Connector (DLC) is a standardized 16-cavity connector. Connector design and location is dictated by an industry wide standard, and is required to provide the following:

- Pin 1 Low speed GMLAN communications terminal
- Pin 2 Class 2 communications terminal

- Pin 3 Mid speed GMLAN serial bus (+) terminal or Object high speed GMLAN serial bus (+) terminal
- Pin 4 Scan tool power ground terminal
- Pin 5 Common signal ground terminal
- Pin 6 High speed GMLAN serial data bus (+) terminal
- Pin 7 Keyword communications terminal
- Pin 11 Mid speed GMLAN serial bus (-) terminal or Object high speed GMLAN serial bus (-) terminal
- Pin 12 Chassis high speed GMLAN serial bus (+) terminal
- Pin 13 Chassis high speed GMLAN serial bus (-) terminal
- Pin 14 High speed GMLAN serial data bus (-) terminal
- Pin 16 Scan tool power, battery positive voltage terminal

Auxiliary Data Connector

The X84B Auxiliary Data Connector is a standardized 16-cavity connector. This connector shall be available on all vehicles that require service programming for controllers on the Powertrain Expansion Bus for Hybrid/EV applications only. Diagnostics shall be available via the X84 Data Link Connector, and not provided via the X84B Auxiliary Data Connector. The pinouts for this X84B Auxiliary Data Connector are as follows:

- Pin 3 High Voltage Energy Management high speed GMLAN serial bus (+) terminal
- Pin 4 Scan tool power ground terminal
- Pin 5 Common signal ground terminal
- Pin 8 Ground terminal for Auxiliary Data Connector identification
- Pin 11 High Voltage Energy Management high speed GMLAN serial bus (-) terminal
- Pin 12 Powertrain high speed GMLAN serial bus (+) terminal
- Pin 13 Powertrain high speed GMLAN serial bus (-) terminal
- Pin 16 Scan tool power, battery positive voltage terminal

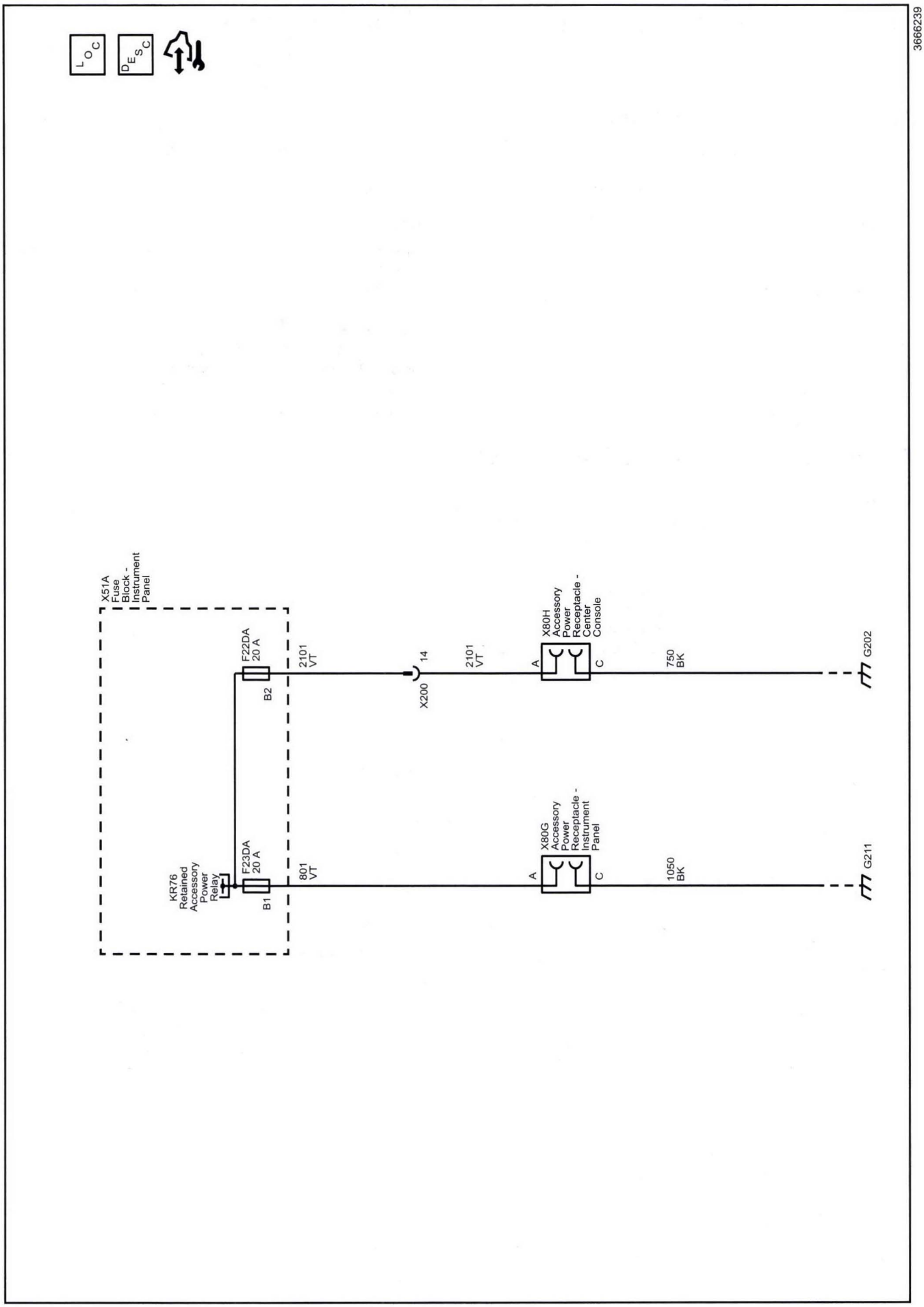
Serial Data Reference

The scan tool communicates over the various buses on the vehicle. When a scan tool is installed on a vehicle, the scan tool will try to communicate with every device that could be optioned into the vehicle. If an option is not installed on the vehicle, the scan tool will display No Comm (or Not Connected) for that optional device. In order to avert misdiagnoses of No Communication with a specific device, refer to *Data Link References on page 11-232* for a list of devices, the buses they communicate with, and the RPO codes for a specific device.

Power Outlets

Schematic and Routing Diagrams

Cigar Lighter/Power Outlet Schematics (Power Outlet)



Diagnostic Information and Procedures

Symptoms - Power Outlets

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Visual/Physical Inspection

- Inspect for aftermarket devices which can affect the operation of the power outlets. Refer to *Checking Aftermarket Accessories on page 11-871*
- Inspect the accessible system components or the visible system components for obvious damage or for obvious conditions which can cause the symptom.

Intermittent

Electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*

Symptom List

Refer to *Power Outlet Receptacle Malfunction on page 11-246* in order to diagnose the system.

Power Outlet Receptacle Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	1	1	—	—
Ground	—	1	–	—
1. Accessory Power Receptacle Malfunction				

Circuit/System Description

The vehicle is fitted with a 12 V accessory power receptacle. The accessory power outlets are controlled by an ignition operated relay. The accessory power receptacle is operational when Vehicle in Service Mode or Vehicle ON.

Diagnostic Aids

It may be helpful to discuss with the customer the usage of any device that may have drawn too much current and caused an open fuse.

Reference Information

Schematic Reference

Cigar Lighter/Power Outlet Schematics on page 11-245

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Outlets Description and Operation on page 11-250

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Circuit/System Verification

1. Vehicle in Service Mode, connect an appropriate device to the X80 Accessory Power Receptacle.
2. Verify the device is powered by the X80 Accessory Power Receptacle.

⇒ **If the device is not powered**

Refer to Circuit/System Testing

⇓ **If the device is powered**

3. All OK.

Circuit/System Testing

1. Vehicle OFF, disconnect the harness connector at the appropriate X80 Accessory Power Receptacle.
2. Test for less than 10 Ω between the ground circuit terminal C and ground.

⇒ **If greater than 10 Ω**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. Verify that a test lamp illuminates between the control circuit terminal A and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the control circuit end to end.

⇒ If greater than 2 Ω, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse. Refer to *Retained Accessory Power Malfunction on page 11-863*.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the control circuit terminal A and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the appropriate X80 Accessory Power Receptacle.

⇓ **If the test lamp illuminates**

5. Replace the appropriate X80 Accessory Power Receptacle.

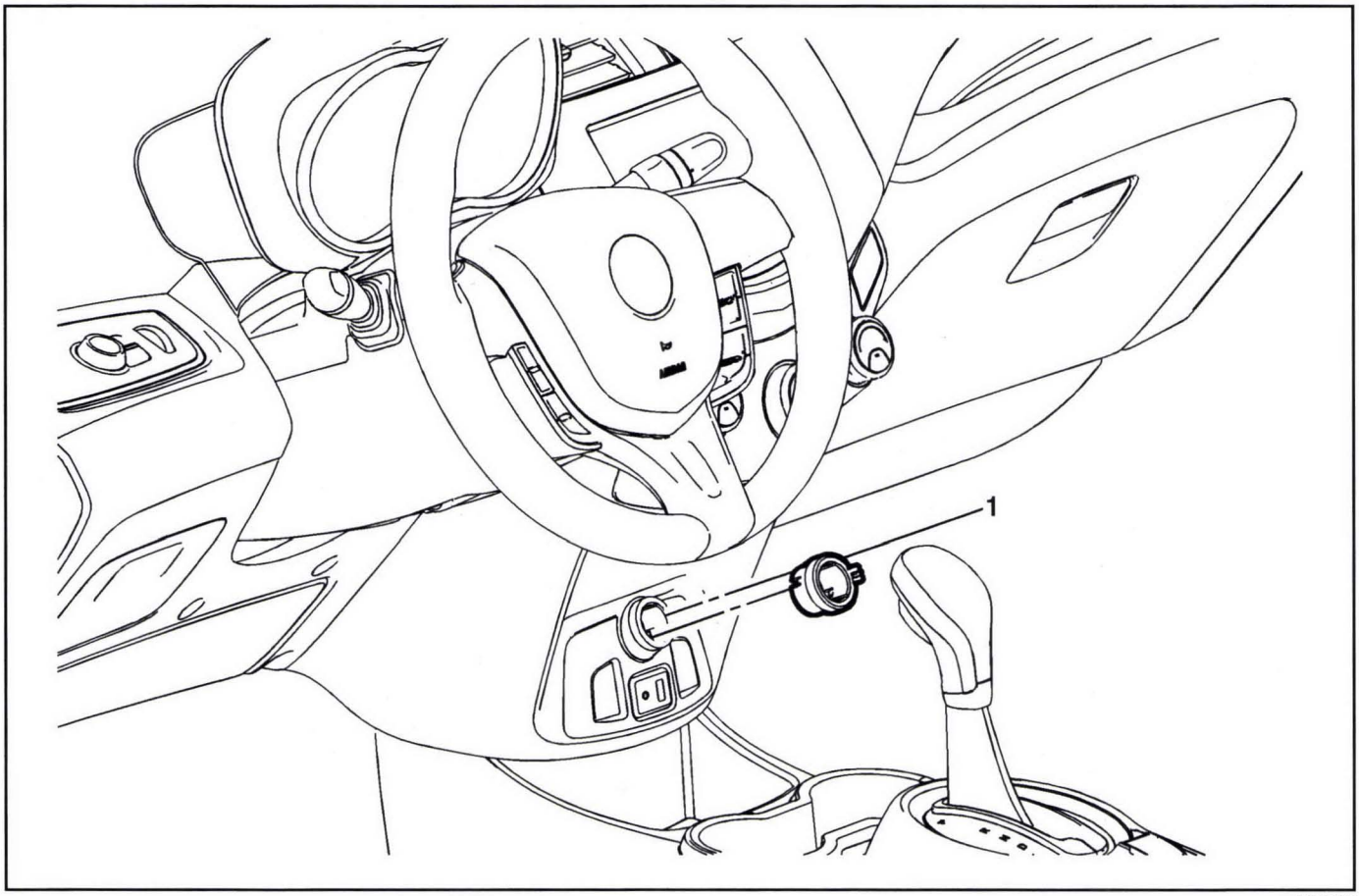
Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Accessory Power Receptacle Replacement on page 11-249

Repair Instructions

Accessory Power Receptacle Retainer Replacement

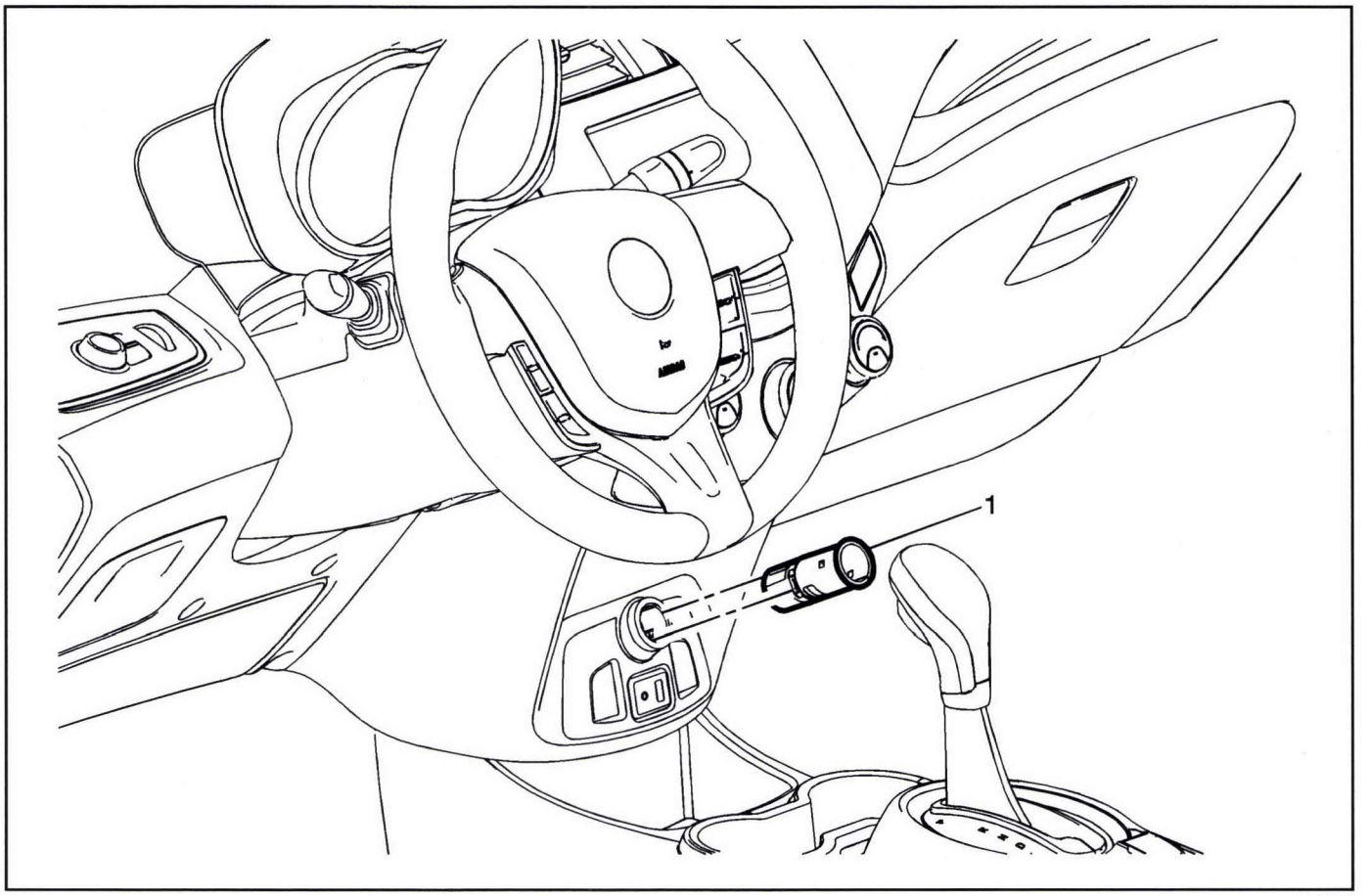


3213924

Accessory Power Receptacle Retainer Replacement

Callout	Component Name
Warning: Refer to Battery Disconnect Warning on page 0-4.	
Preliminary Procedure 1. Disconnect battery negative cable. Refer to *Battery Negative Cable Disconnection and Connection on page 9-20*. 2. Remove accessory power/cigar lighter receptacle. Refer to *Accessory Power Receptacle Replacement on page 11-249*.	
1	Accessory Power/Cigarette Lighter Receptacle Retainer

Accessory Power Receptacle Replacement



3213923

Accessory Power Receptacle Replacement

Callout	Component Name
Preliminary Procedure Disconnect battery negative cable. Refer to *Battery Negative Cable Disconnection and Connection on page 9-20*.	
1	Accessory Power/Cigarette Lighter Receptacle **Procedure** Disconnect electrical connectors. **Special Tools** *BO-48871* Cigar Lighter Socket Remover For equivalent regional tools, refer to *Special Tools on page 11-250*.

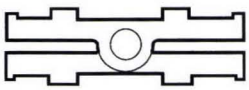
Description and Operation

Power Outlets Description and Operation

System Description

The vehicle is fitted with a cigarette lighter and/or with a 12 V accessory power receptacle. The cigarette lighter and accessory power outlets are controlled by an ignition operated relay. The accessory power receptacle and cigarette lighter are operational when the ignition is turned to either the On or the Accessories positions. To operate the cigarette lighter, press in the lighter knob. When the element is hot, the lighter automatically pops out and is ready for use.

Special Tools and Equipment

Illustration	Tool Number/ Description
 2028358	BO-48871 Cigar Lighter Socket Remover

Wiring Systems and Power Management

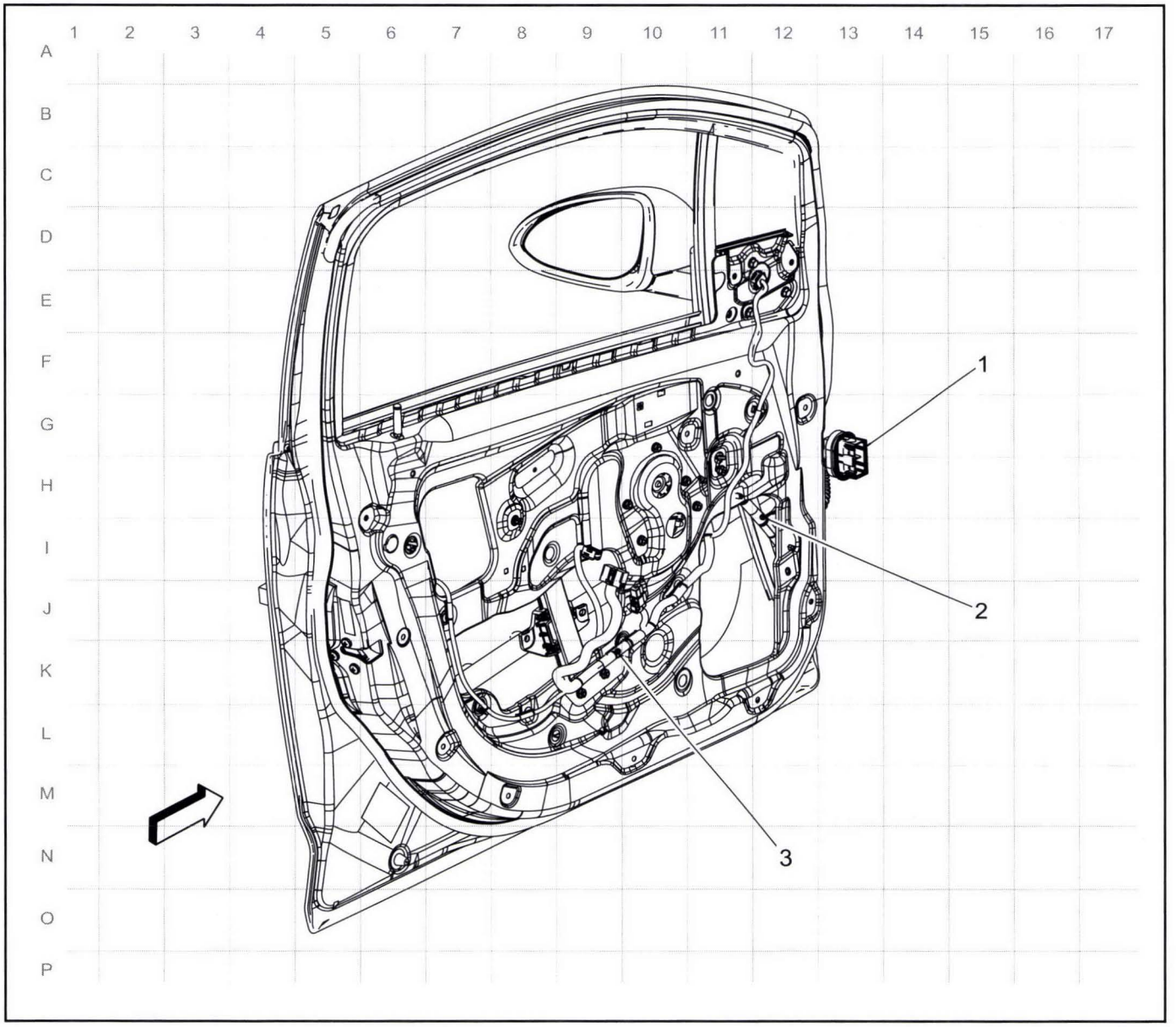
Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Ground Fastener M6 Nut	9 N•m	80 lb in
Ground Fastener M6 Nut – Repair	8 N•m	71 lb in
Ground Fastener M7 Bolt	9 N•m	80 lb in
Ground Fastener M8 Nut	22 N•m	16 lb ft
Ground Fastener M10 Nut	45 N•m	33 lb ft

Schematic and Routing Diagrams

Harness Routing Views (Driver Door Harness Routing)

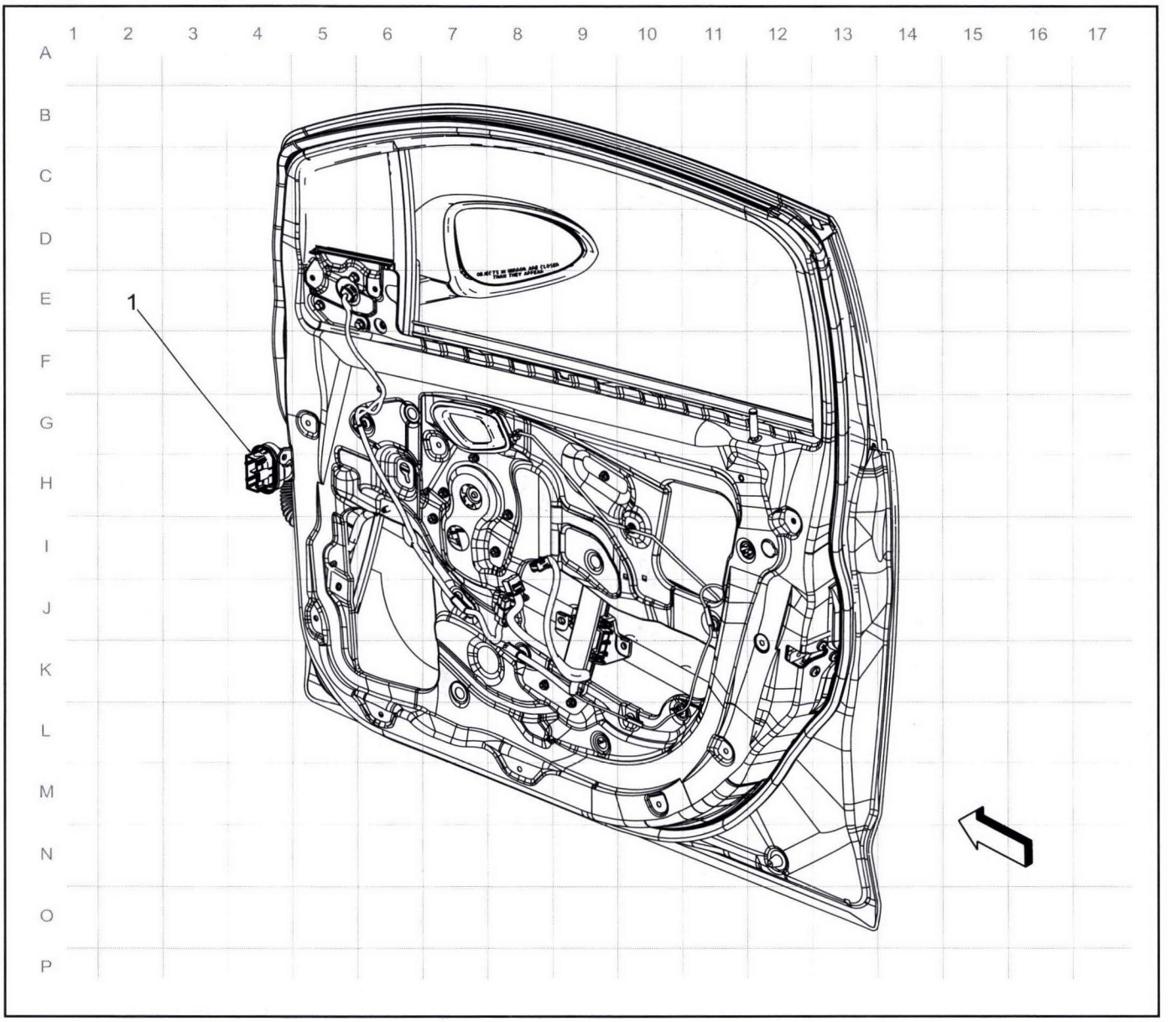


3212935

Items

(1) X500
(2) J500
(3) J501

Harness Routing Views (Passenger Door Harness Routing)

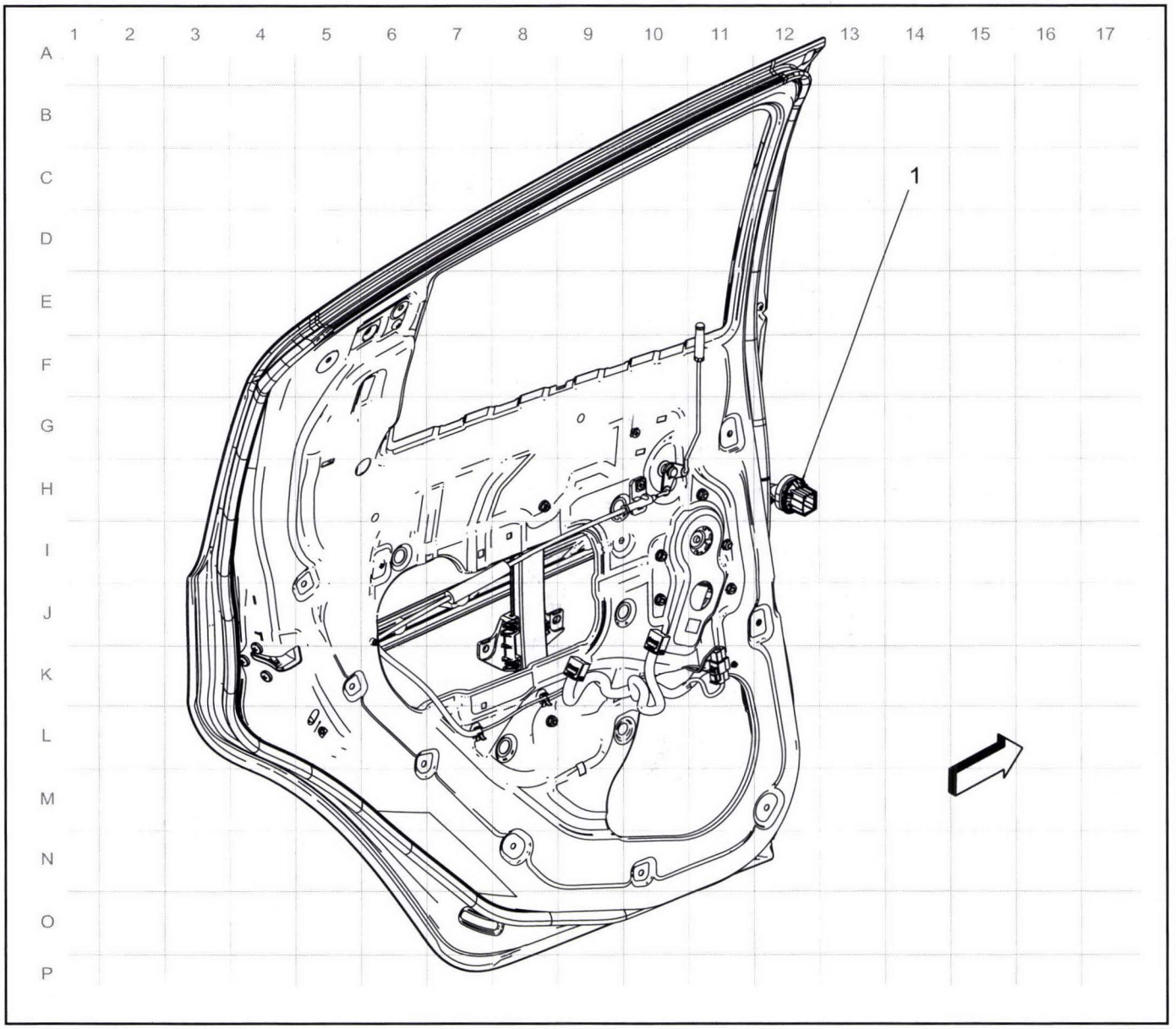


3212938

Items

(1) X600

Harness Routing Views (Left Rear Door Harness Routing)

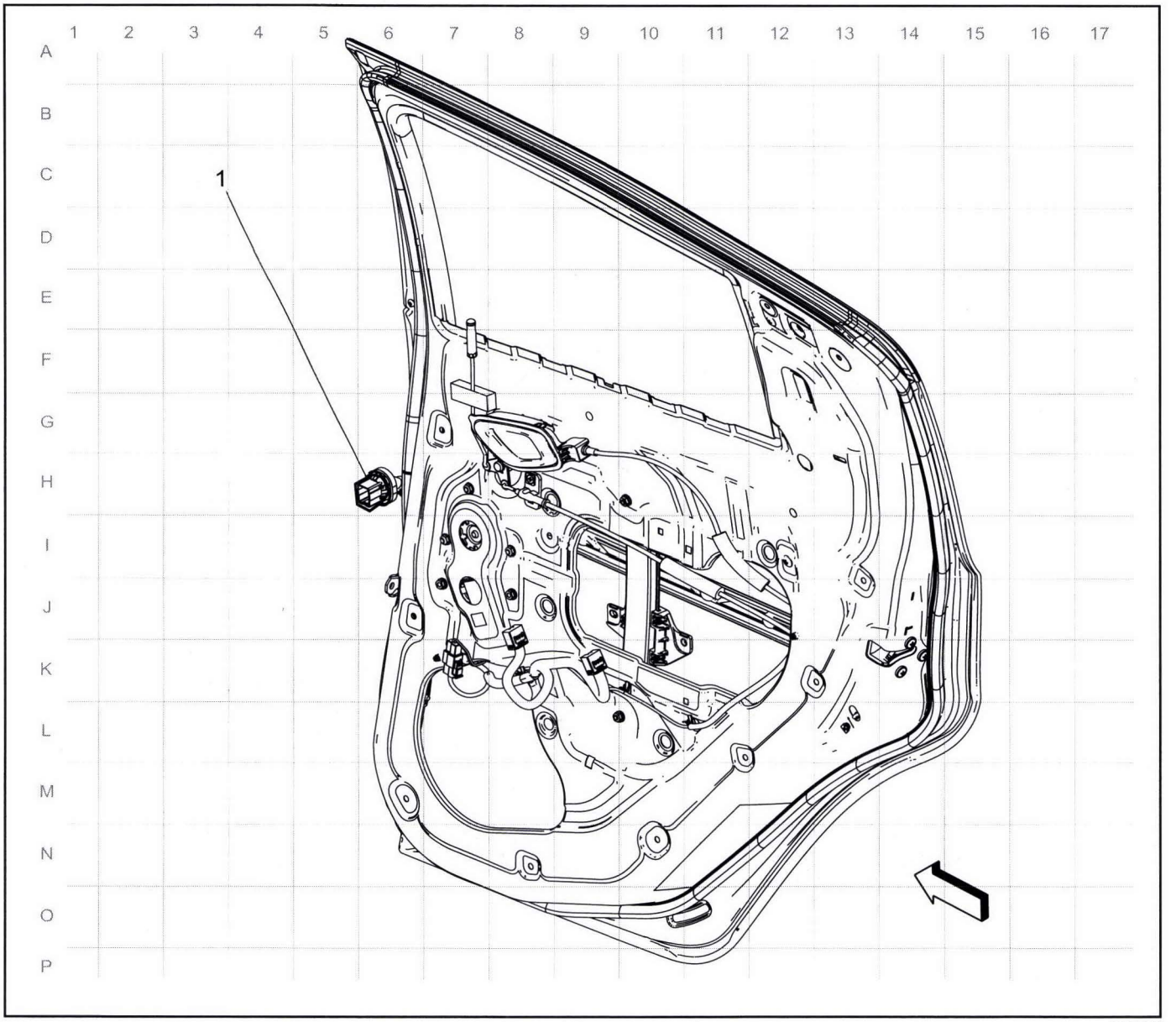


3212940

Items

(1) X700

Harness Routing Views (Right Rear Door Harness Routing)

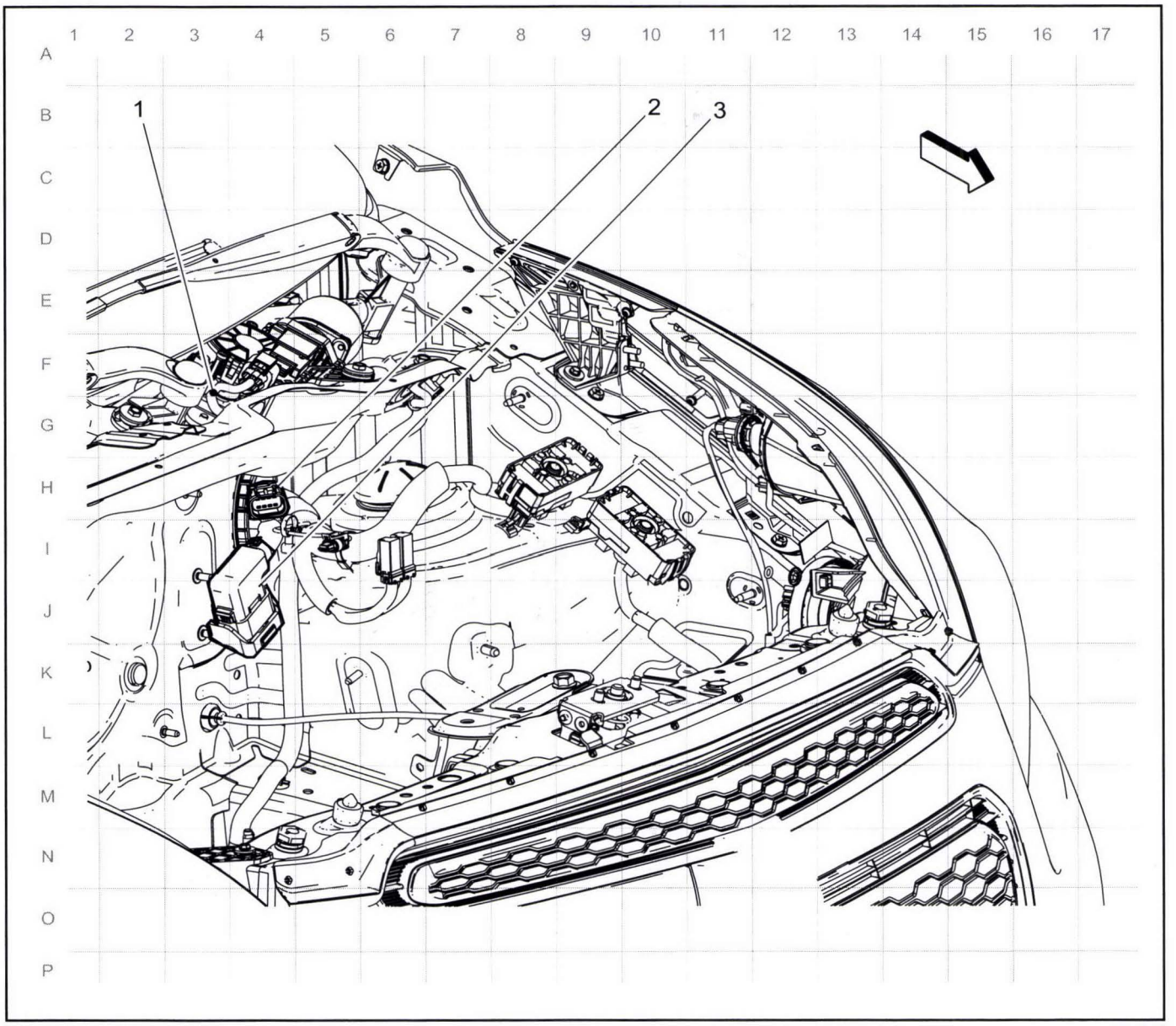


3212943

Items

(1) X800

Harness Routing Views (Left Side Engine Compartment Harness Routing)

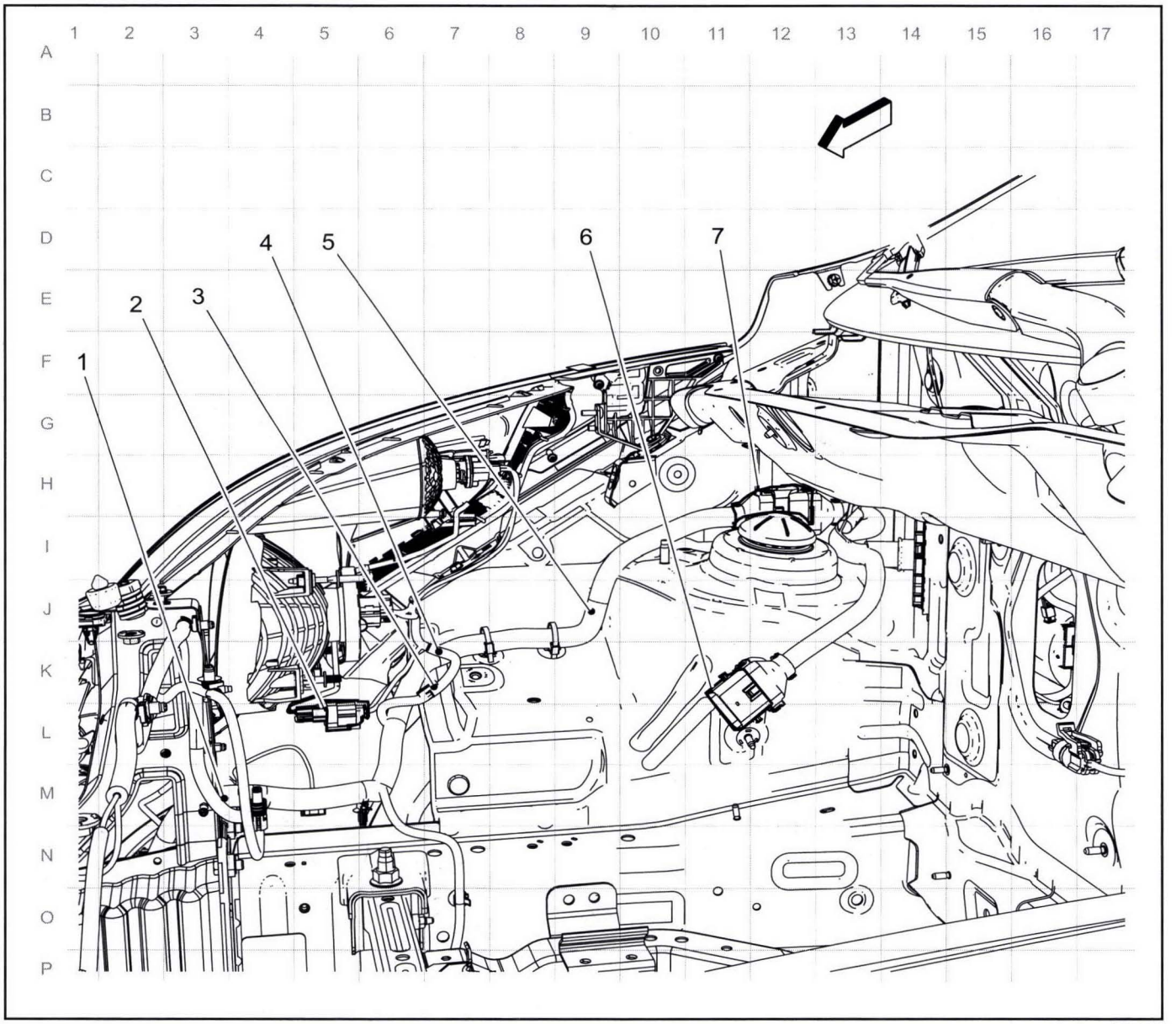


3212796

Items

(1) J101
(2) X100
(3) X105

Harness Routing Views (Right Side Engine Compartment Harness Routing)

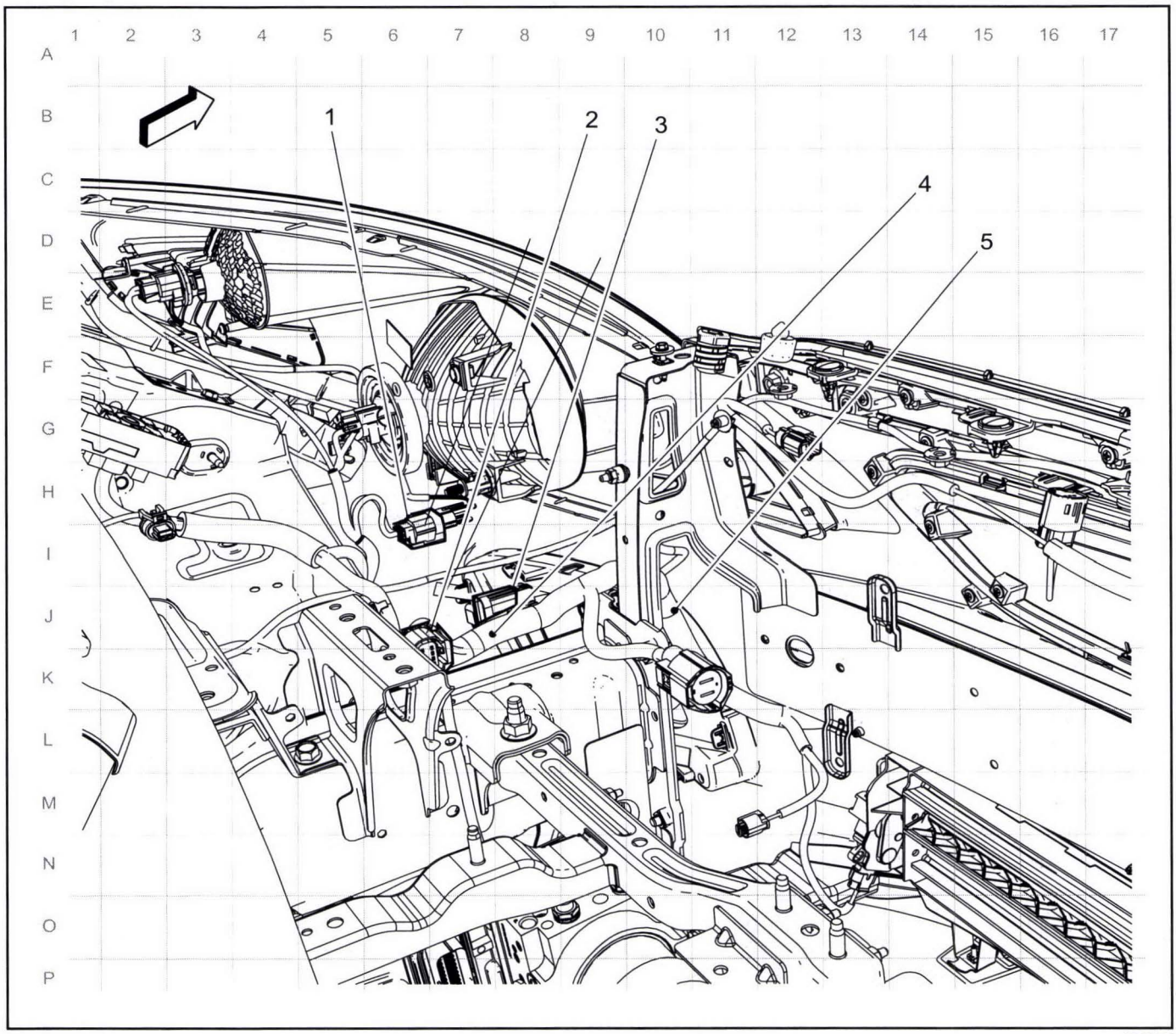


3212798

Items

(1) J113
(2) X120
(3) J110
(4) J111
(5) J112
(6) X115
(7) X106

Harness Routing Views (Left Front of Engine Compartment Harness Routing)

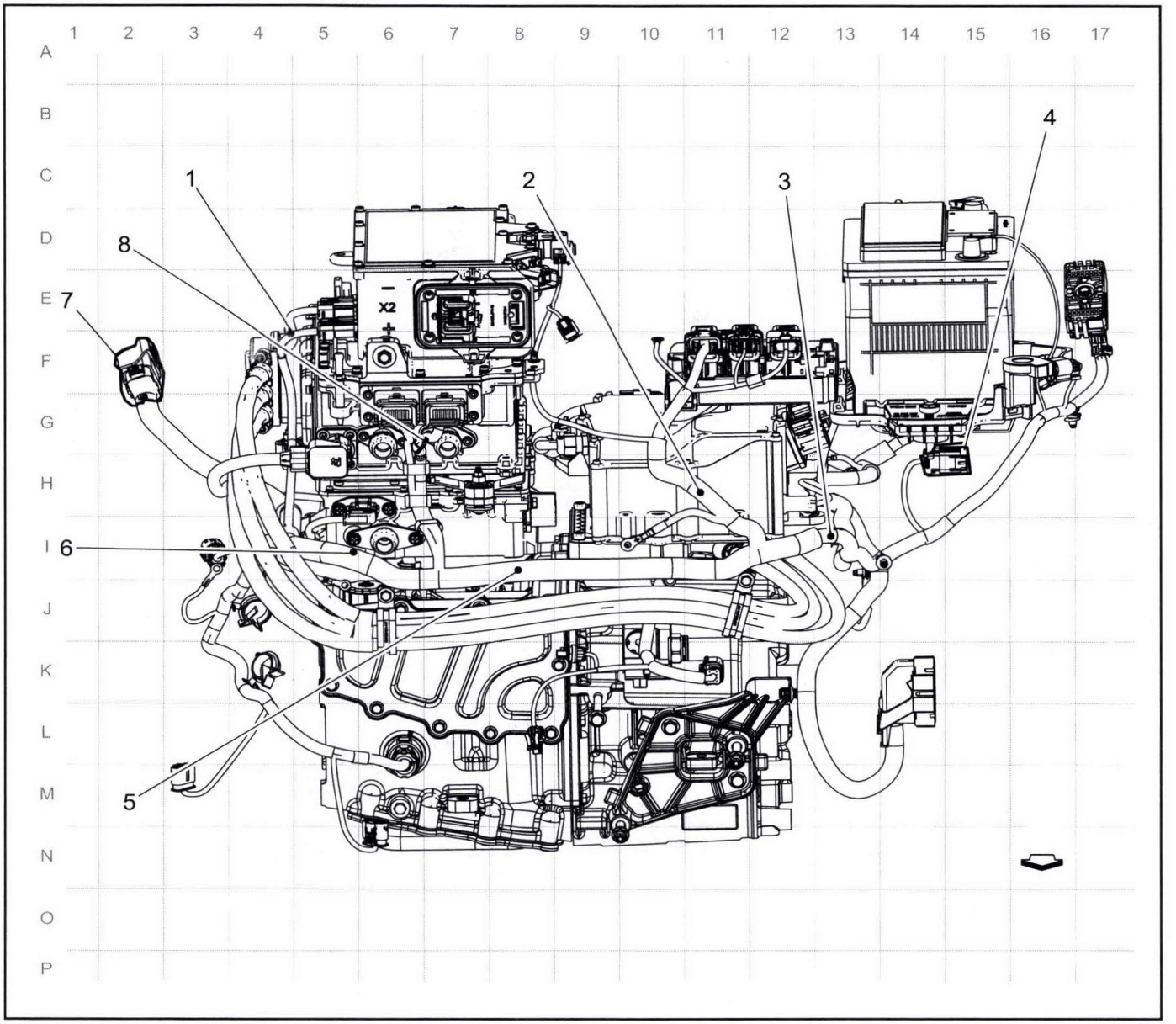


3212800

Items

(1) X110
(2) X116
(3) X117
(4) J108
(5) J109

Harness Routing Views (Front of Drive Motor Harness Routing View)

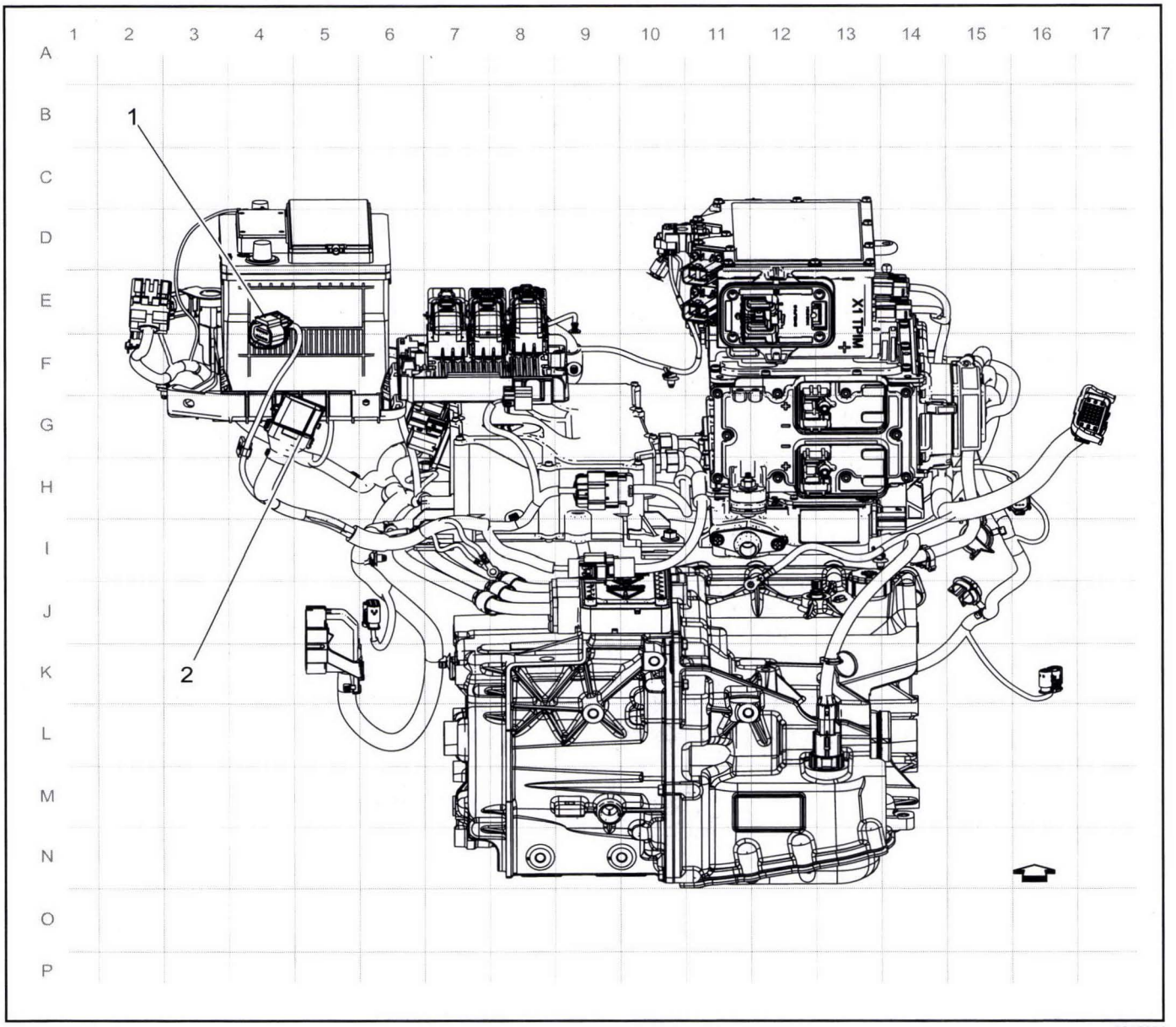


3212803

Items

(1) J102
(2) J106
(3) J107
(4) X117
(5) J105
(6) J103
(7) X115
(8) J104

Harness Routing Views (Rear of Drive Motor Harness Routing View)

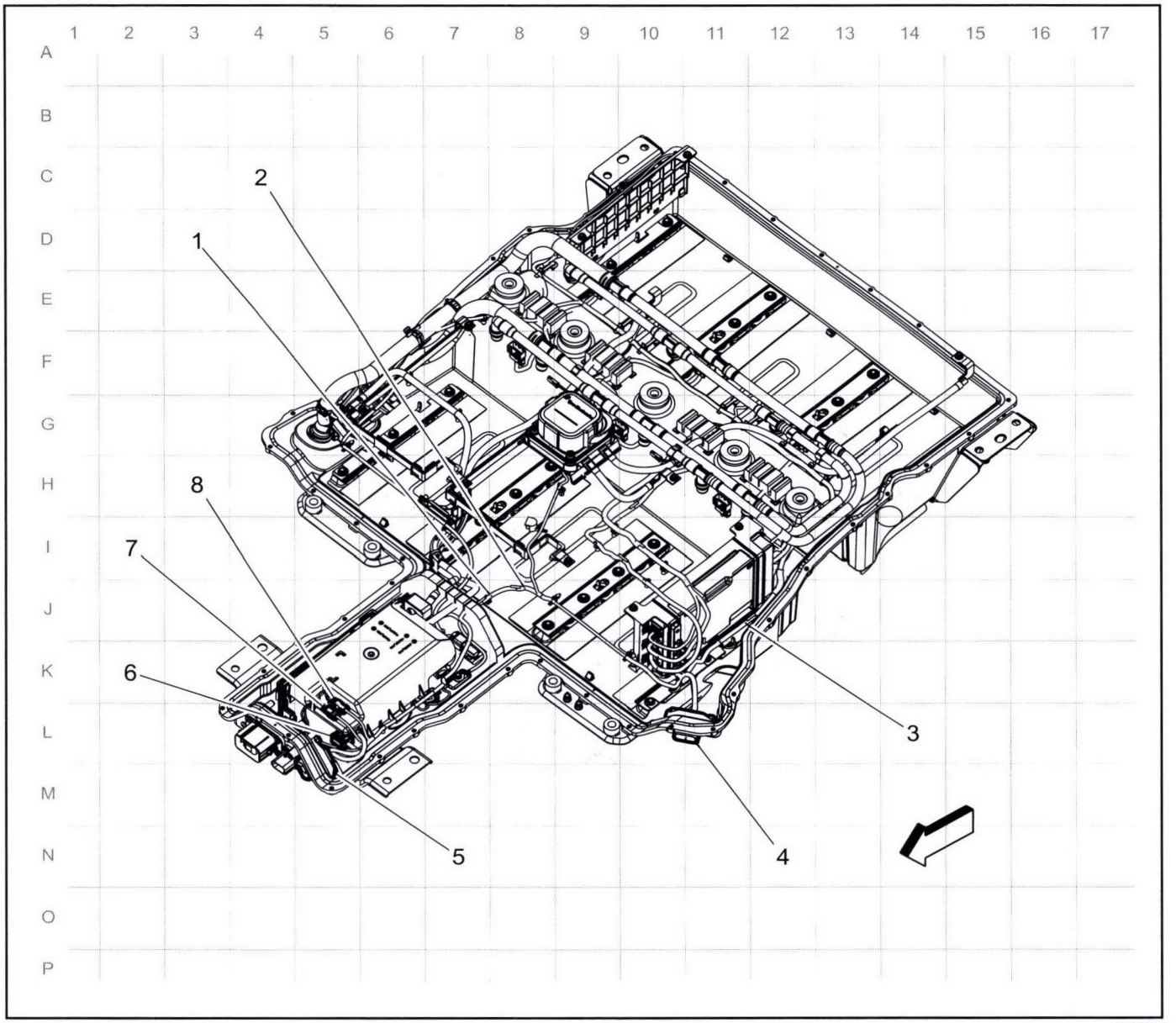


3212806

Items

(1) X215
(2) X105

Harness Routing Views (High Voltage Battery Internal Harness Routing View (1 of 2))

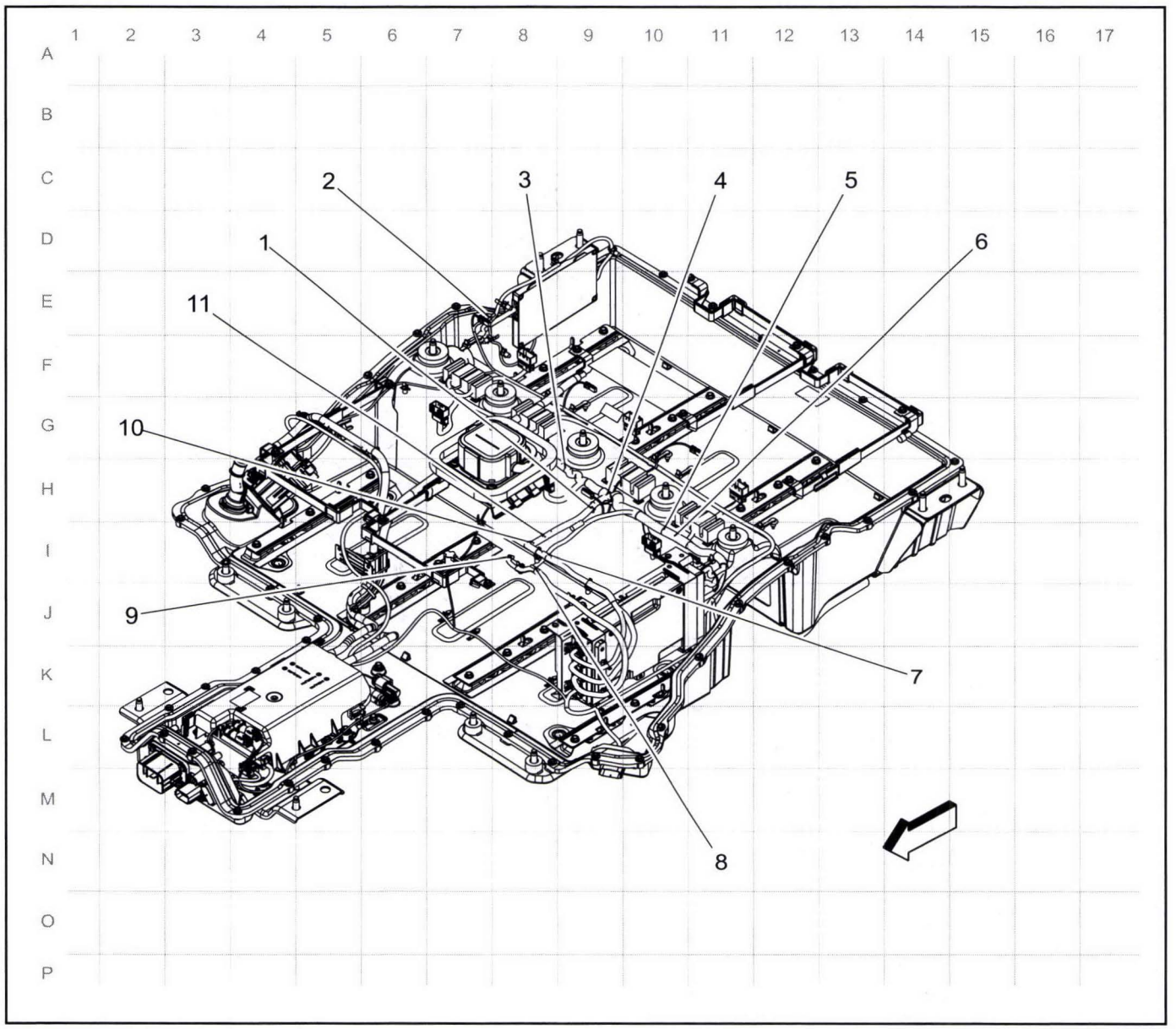


3968965

Items

(1) J353
(2) J351
(3) J352
(4) X357
(5) X358
(6) X359
(7) X352
(8) X351

Harness Routing Views (High Voltage Battery Internal Harness Routing View (2 of 2))

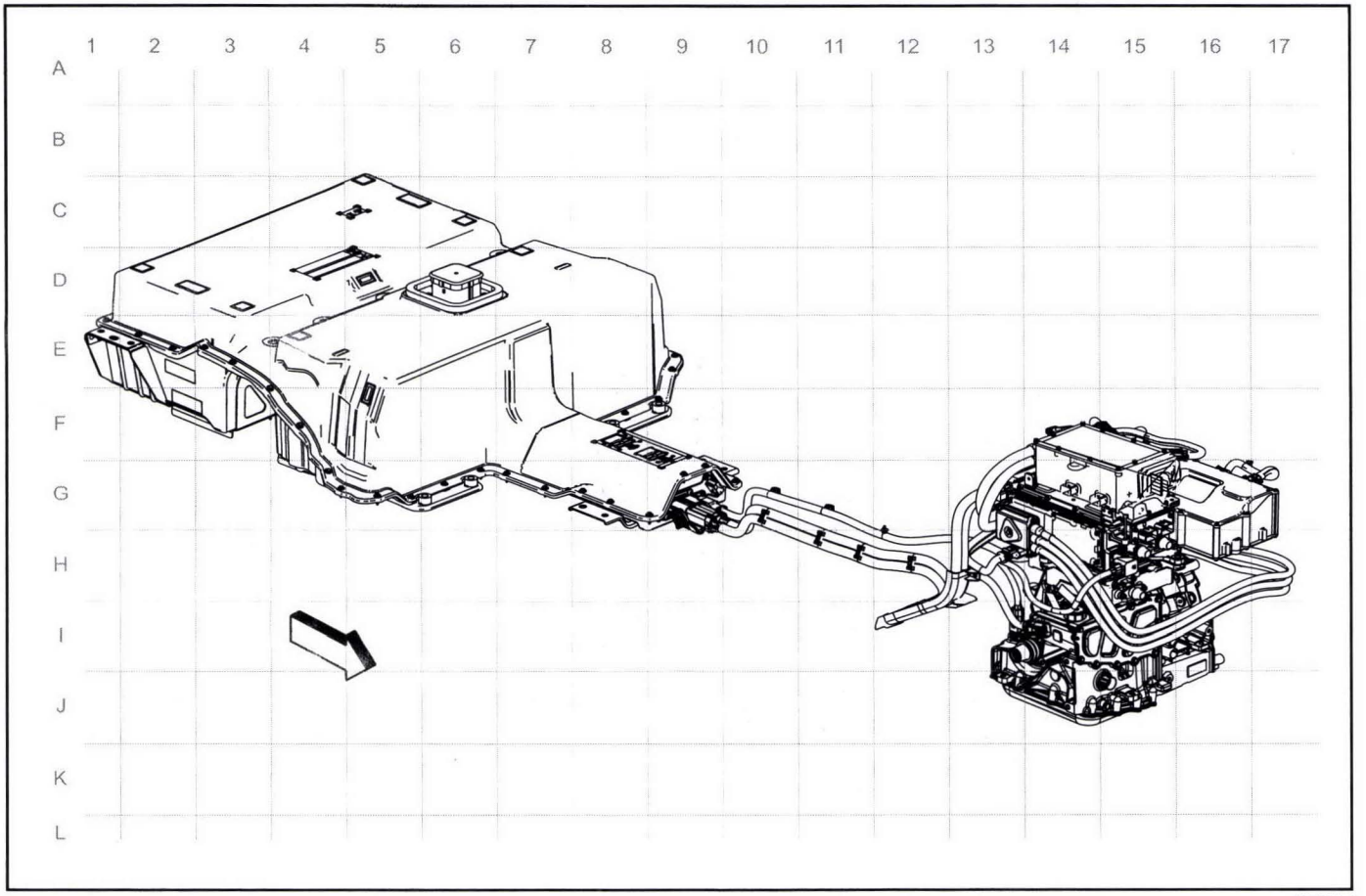


3968966

Items

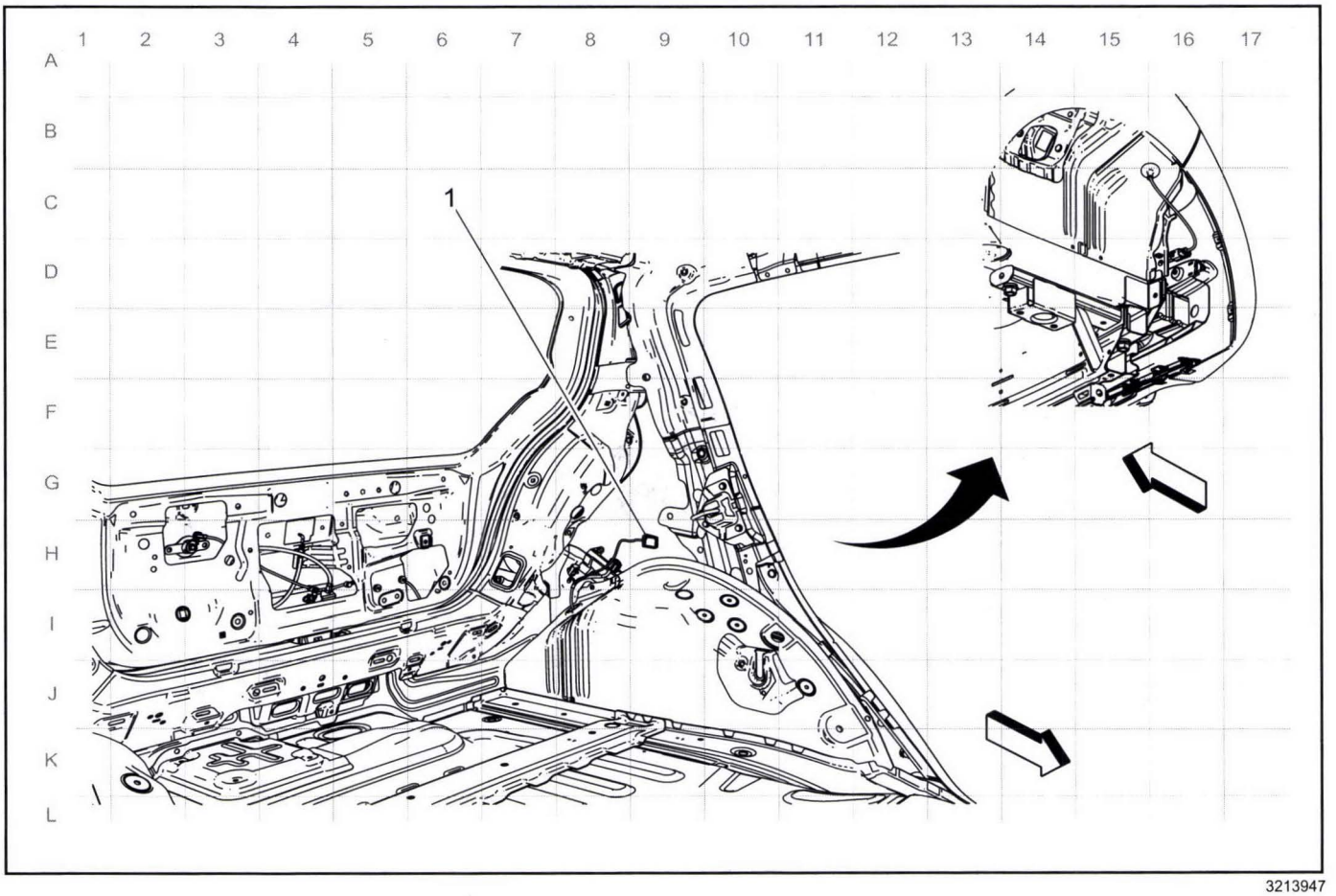
(1) J367
(2) J371
(3) J370
(4) J361
(5) J362
(6) J363
(7) J364
(8) J369
(9) J368
(10) J365
(11) J366

Harness Routing Views (High Voltage Harness Routing)



3512333

Harness Routing Views (Rear Body Extension Harness Routing (UD7))

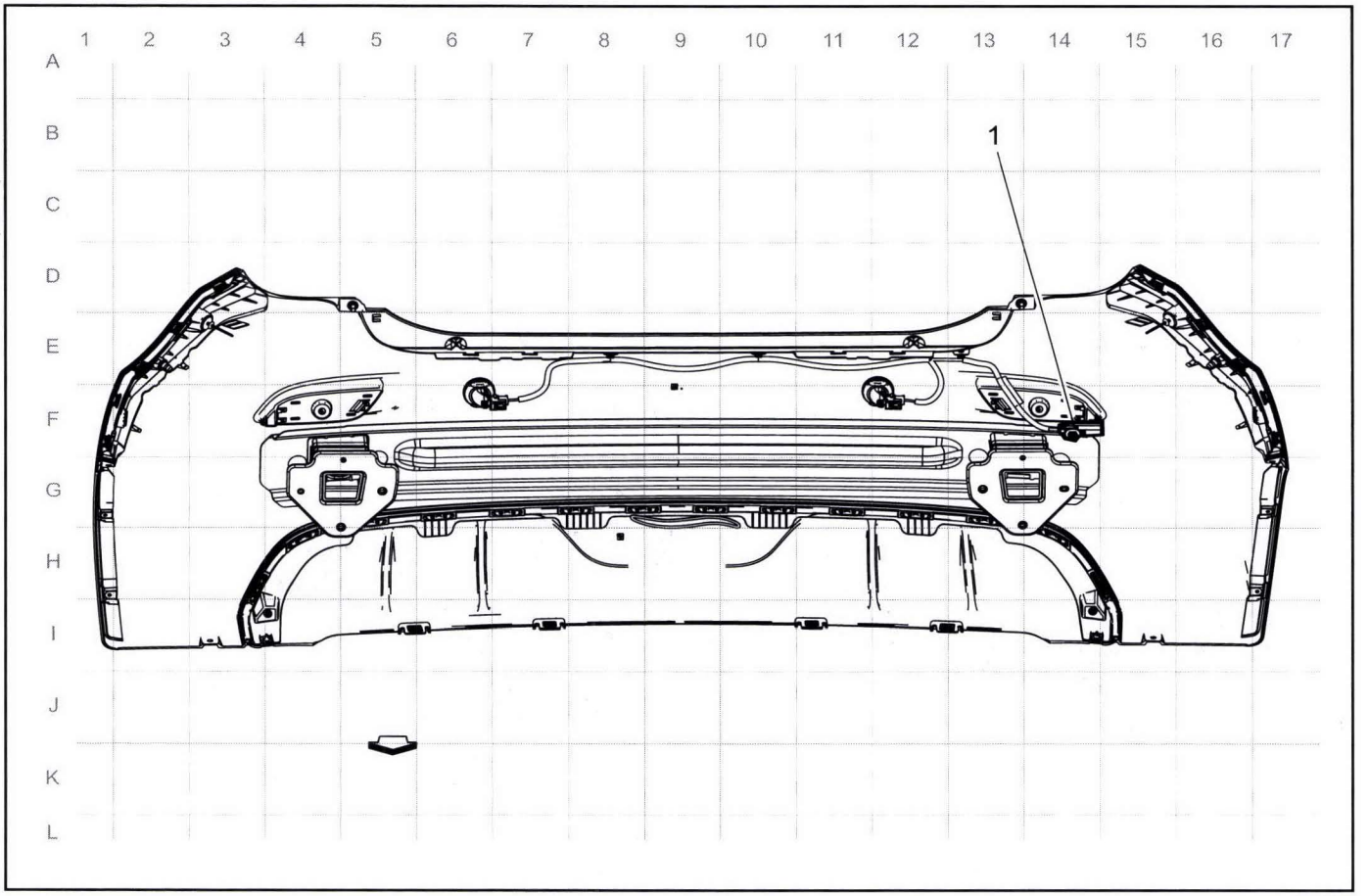


3213947

Items

(1) X405

Harness Routing Views (Rear Fascia Harness Routing (UD7))

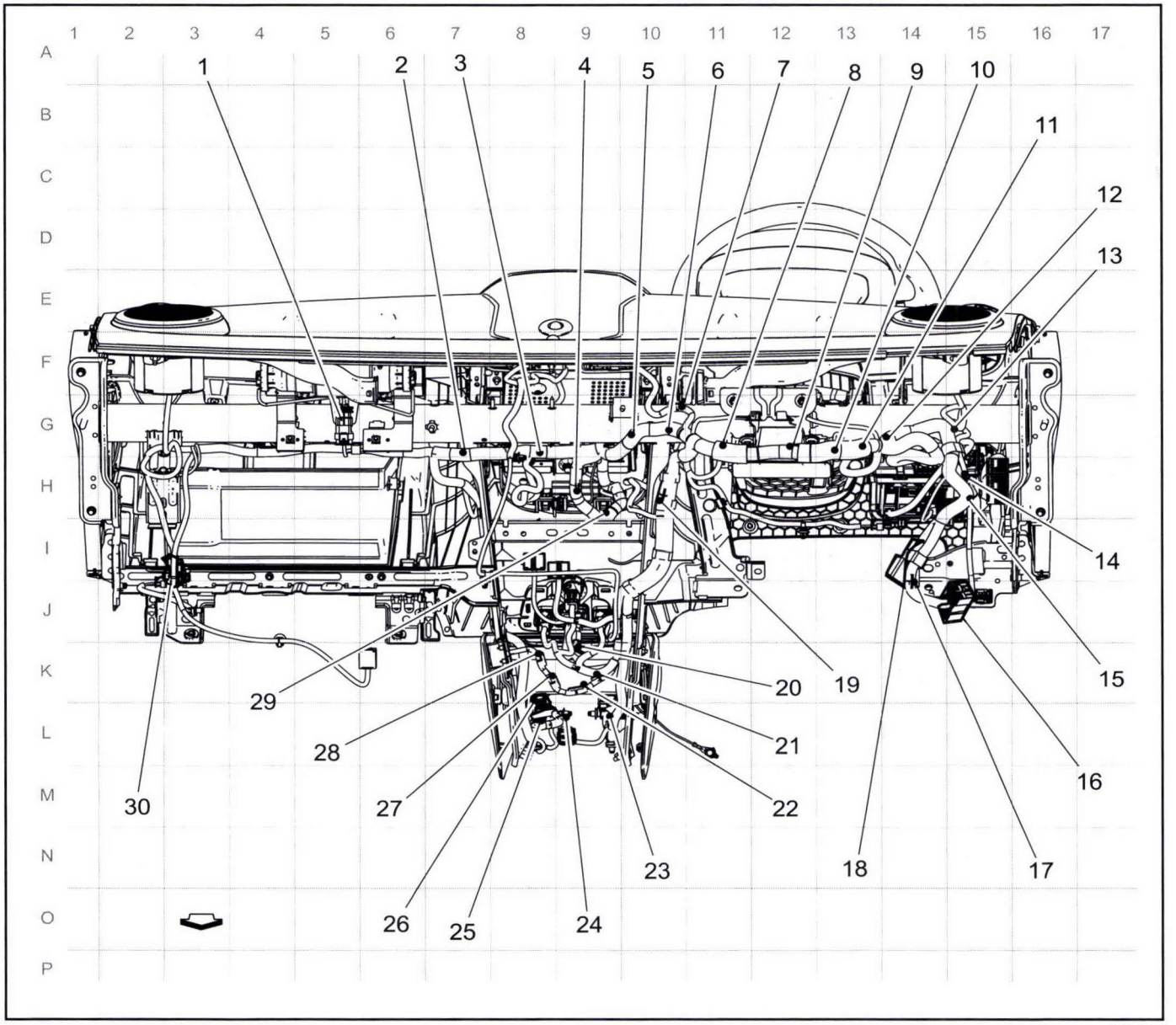


3213945

Items

(1) X450 (UD7)

Harness Routing Views (Instrument Panel Harness Routing)



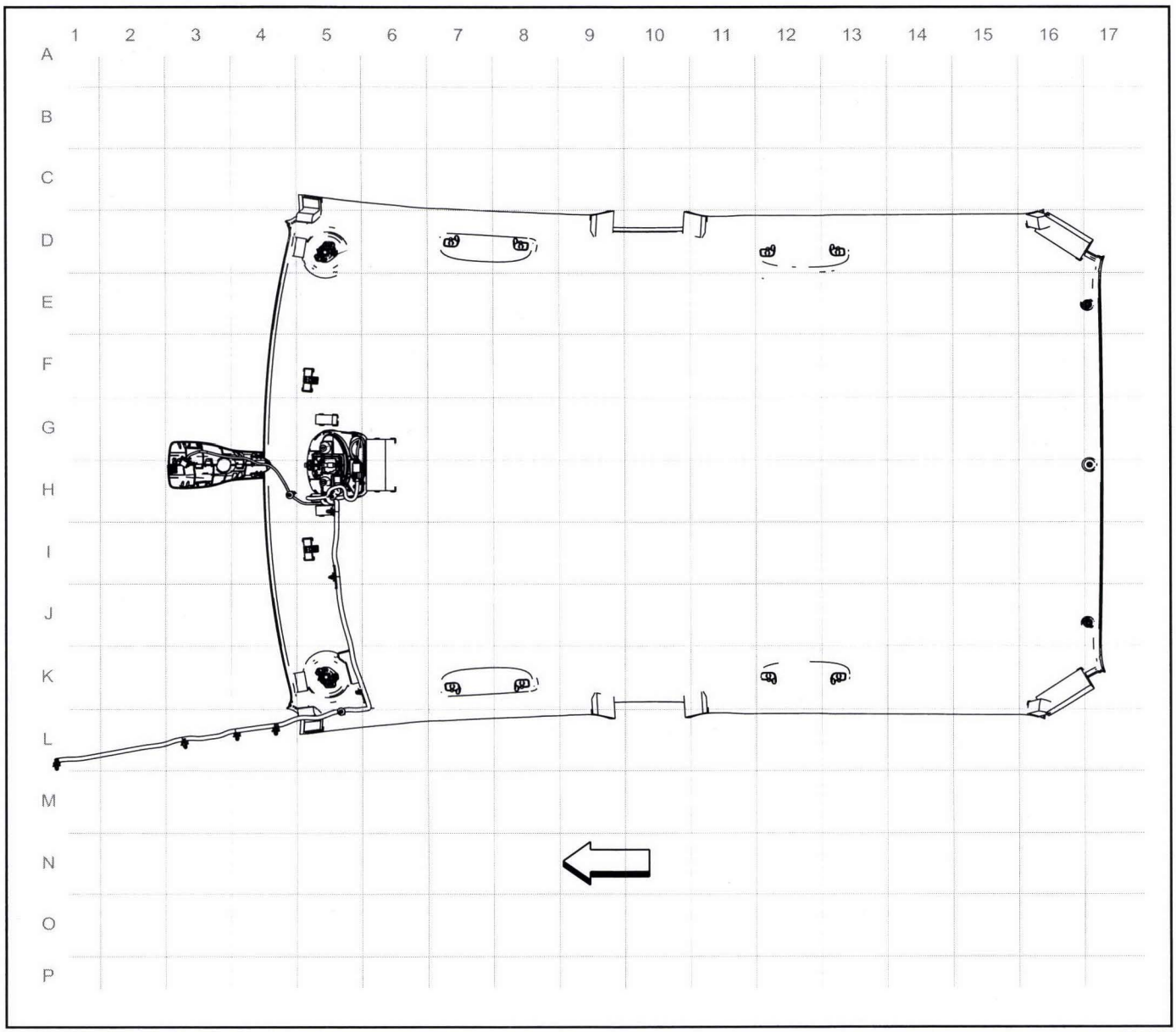
3214035

Items

(1) X235
(2) J226
(3) J225
(4) J220
(5) J219
(6) J218
(7) J217
(8) J214
(9) J213
(10) J212
(11) J211
(12) J210
(13) J207
(14) J206
(15) J209
(16) X200
(17) J208
(18) X215
(19) J216
(20) J223
(21) J229
(22) J230
(23) J233
(24) J228
(25) J227
(26) X310
(27) J231
(28) J232

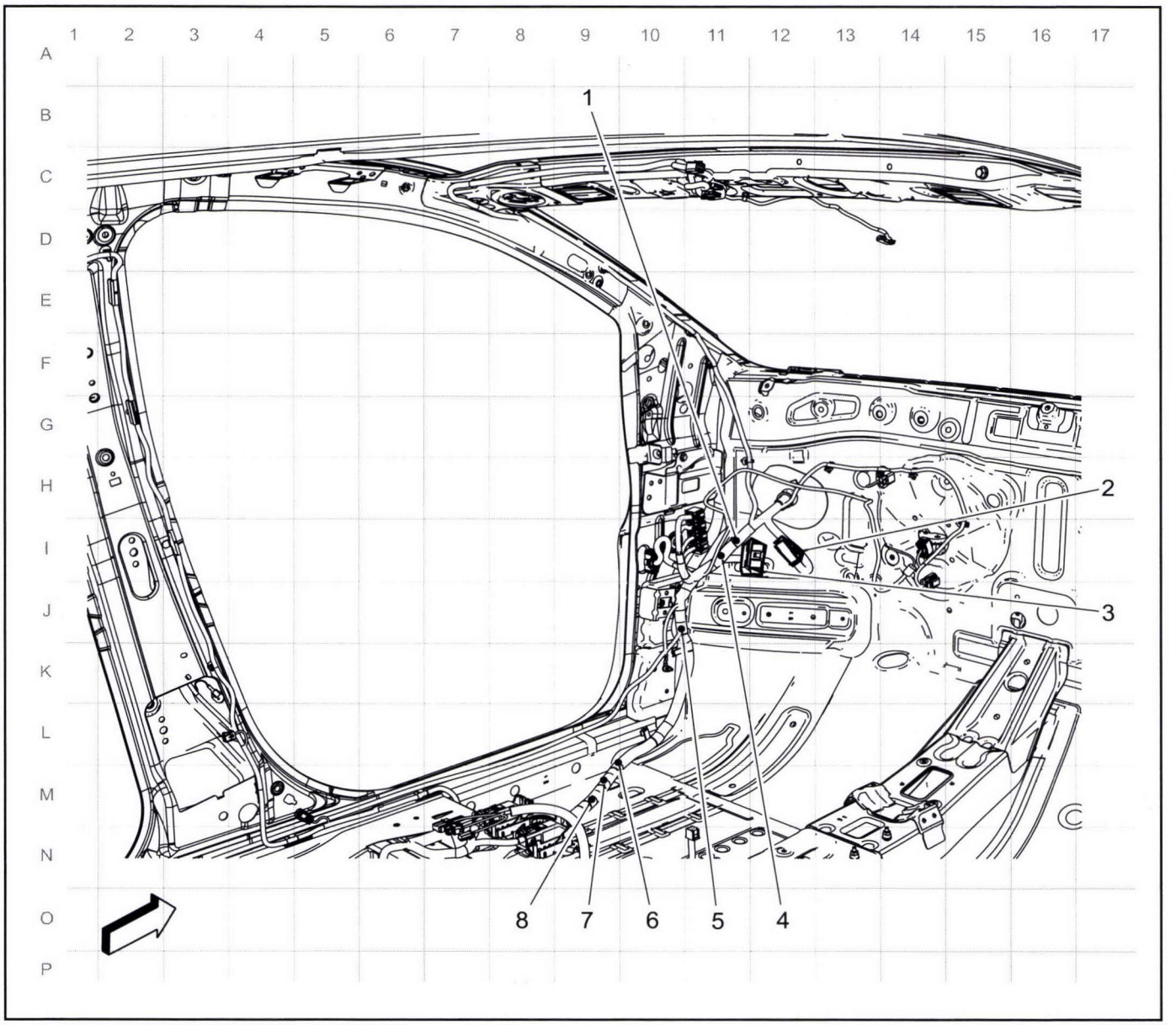
(29) J222
(30) X210

Harness Routing Views (Headliner Harness Routing)



3214044

Harness Routing Views (Left Front of Passenger Compartment Harness Routing)

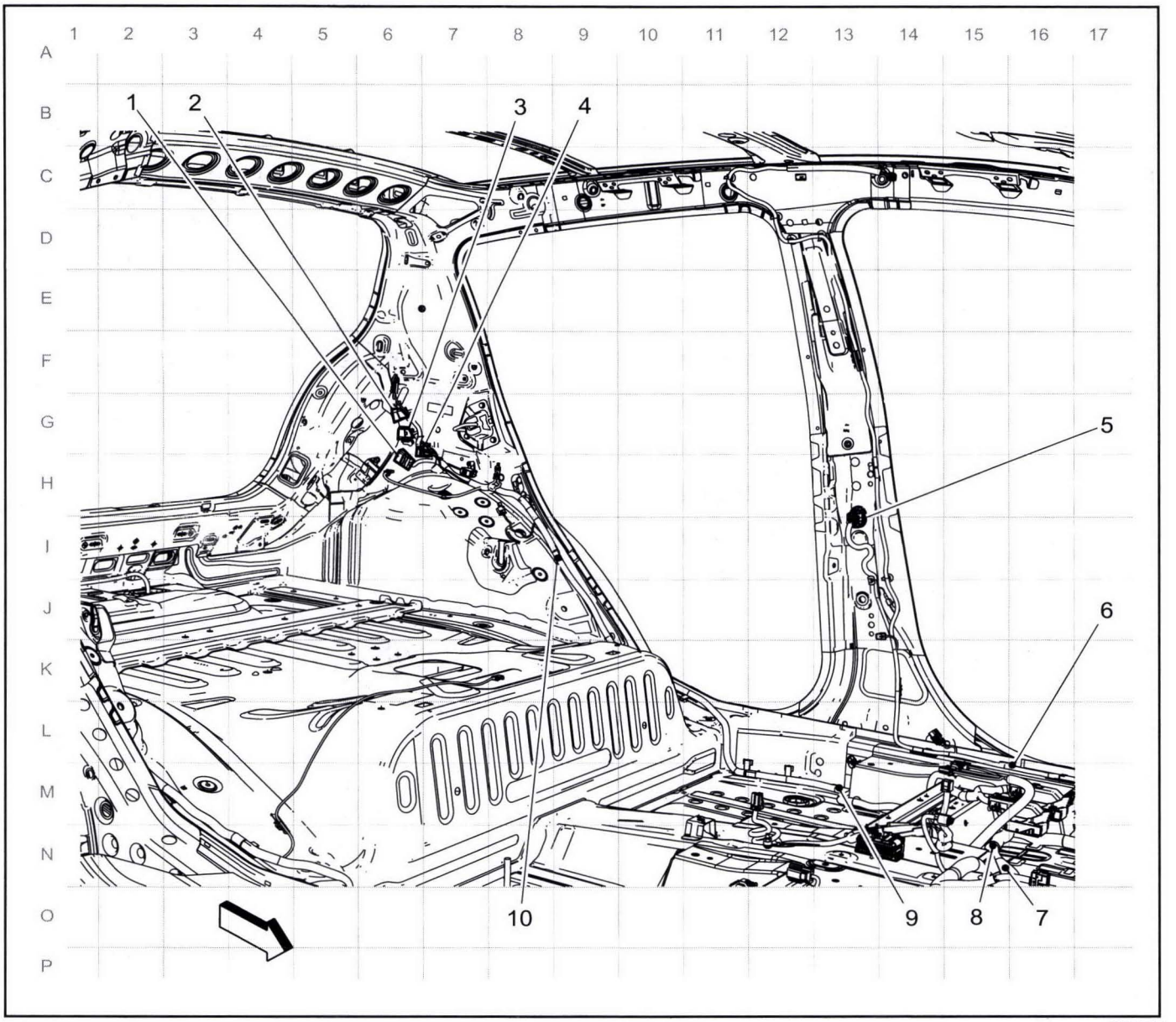


3214055

Items

(1) J200
(2) X215
(3) X200
(4) J201
(5) J202
(6) J302
(7) J303
(8) J304

Harness Routing Views (Left Rear of Passenger Compartment Harness Routing)

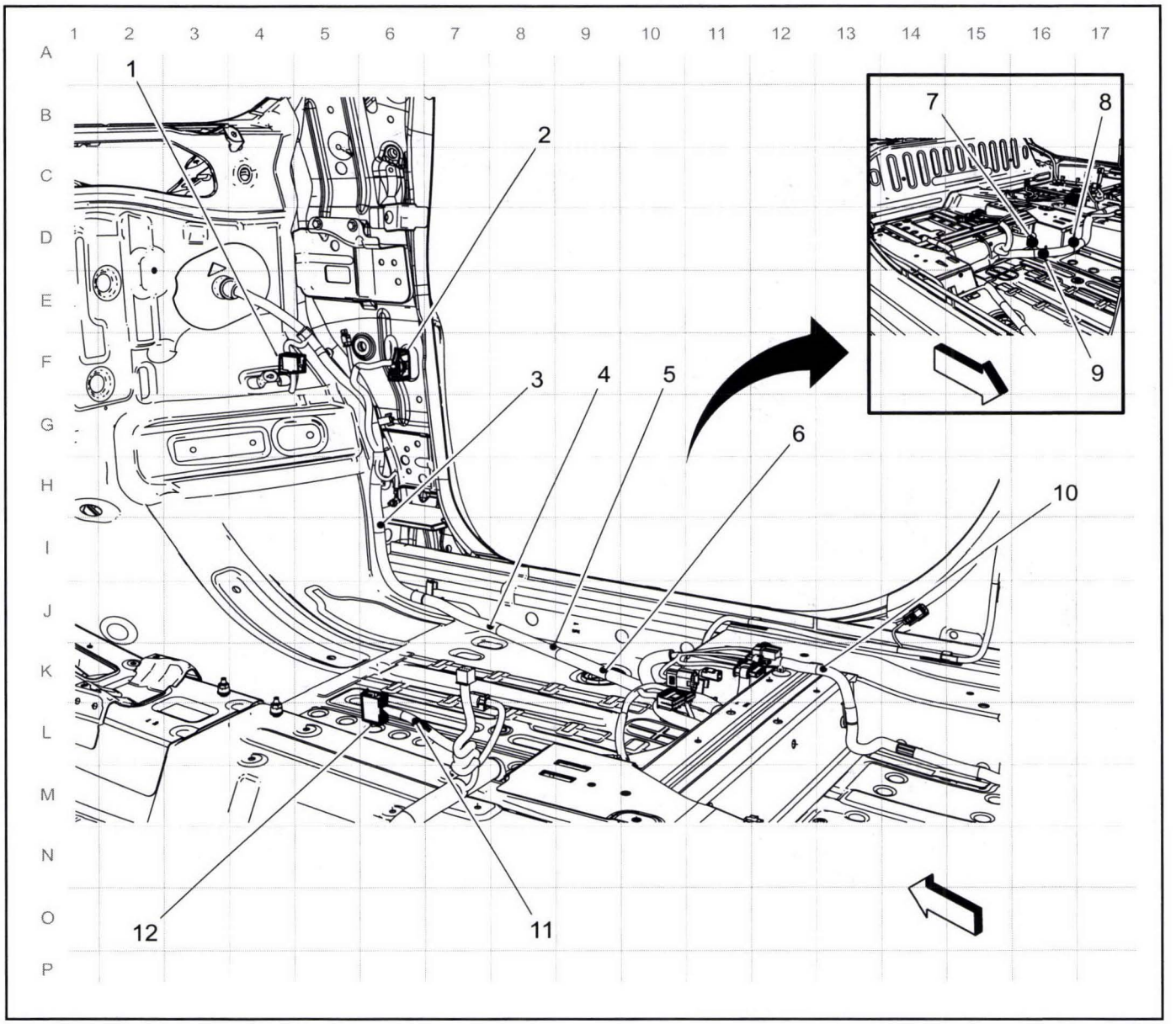


3214057

Items

(1) X900
(2) X410
(3) X905 ((UVC))
(4) X405
(5) X700
(6) J313
(7) J312
(8) J313
(9) J317
(10) J318

Harness Routing Views (Right Front of Passenger Compartment Harness Routing)

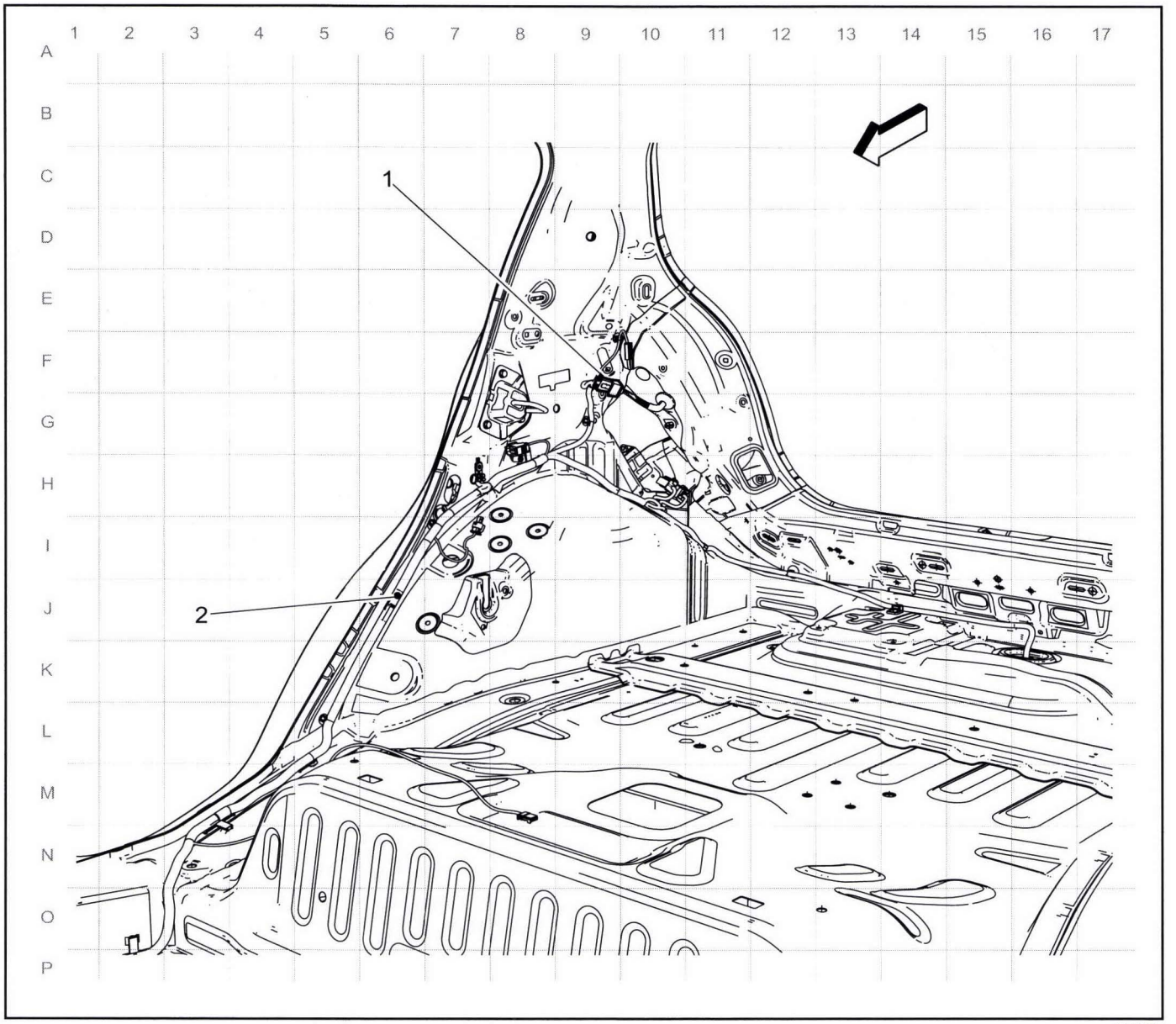


3214062

Items

(1) X210
(2) X600
(3) J235
(4) J305
(5) J306
(6) J307
(7) J308
(8) J311
(9) J310
(10) J314
(11) J309
(12) X310

Harness Routing Views (Right Rear of Passenger Compartment Harness Routing)

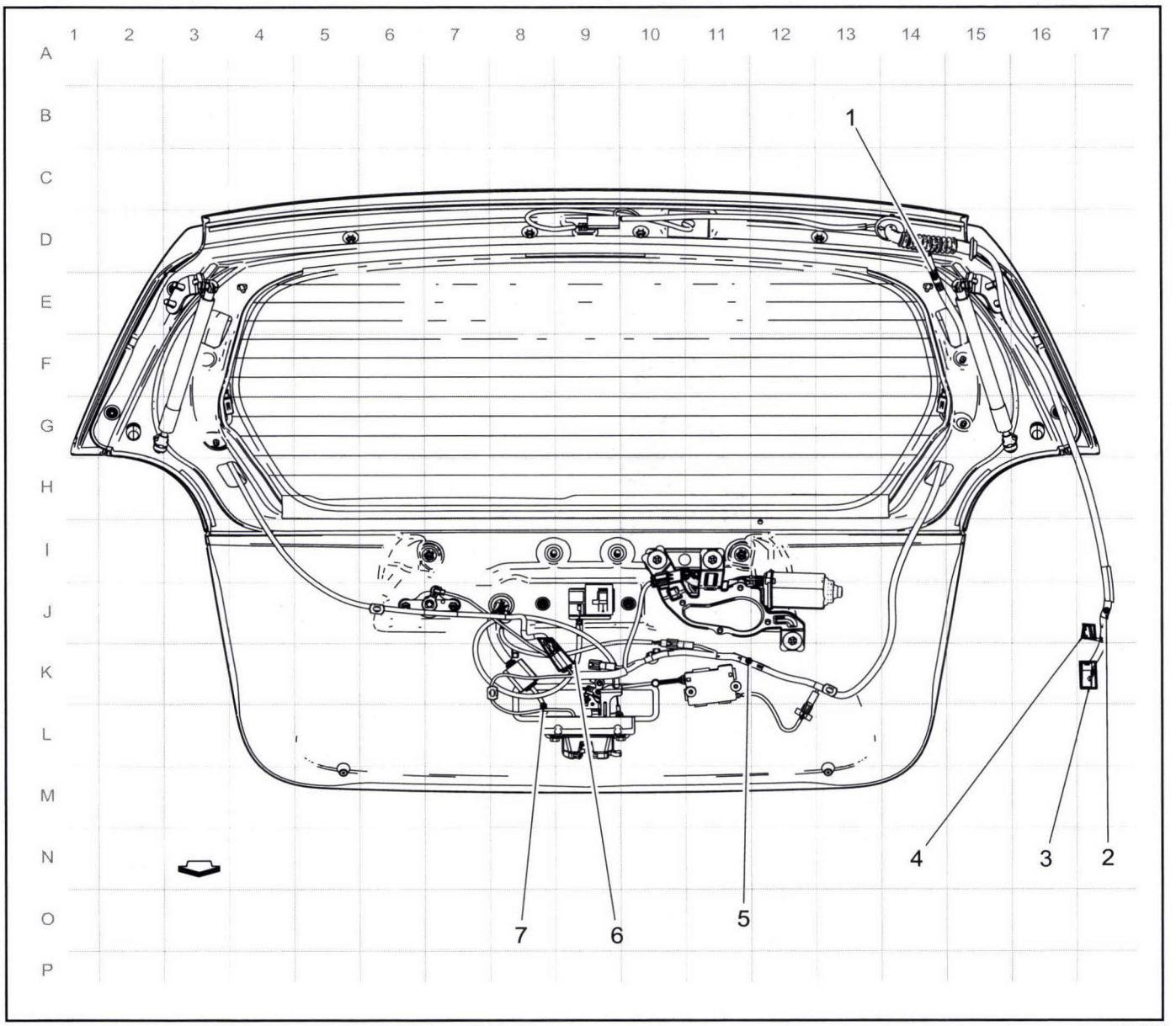


3214064

Items

(1) X420
(2) J319

Harness Routing Views (Liftgate Harness Routing)



3214080

Items

(1) J902
(2) J900
(3) X900
(4) X905 ((UVC))
(5) J903
(6) X902
(7) J901 (UVC)

How to Use Electrical Schematics

Information Overview

The following explains some of the key parts of the GM wiring diagrams. Included are:

- Color Abbreviations
- Electronic Delivery Navigation Features

Color Abbreviations

The following sequence is used when depicting wire colors:

1. Color modifier of the wire, such as light or dark (if applicable)
2. Primary color of the wire
3. Secondary color of the wire (tracer/stripe)

Wire insulation and connector body colors in schematic information are abbreviated with a two character code as listed below.

Abbreviation	Color	Abbreviation	Color
AM	Amber	OG	Orange
Bare	Bare	PK	Pink
BG	Beige	PU	Purple
BK	Black	RD	Red
BN	Brown	RU	Rust
BU	Blue	SR	Silver
CL	Clear	TL	Teal
CR	Cream	TN	Tan
CU	Curry	TQ	Turquoise
GD	Gold	VT	Violet
GN	Green	WH	White
GY	Gray	YE	Yellow
NA	Natural	—	—
Color Modifiers			
L	Light	D	Dark

Additionally, industry standard cable types are not identified by color, but are listed by cable type as follows:

Abbreviation	Cable Type
COAX	Coax Cable
FW	Flat Wire
HDMI	High Definition Multimedia Interface
TWINAX	Twinax Cable
USB	Universal Serial Bus

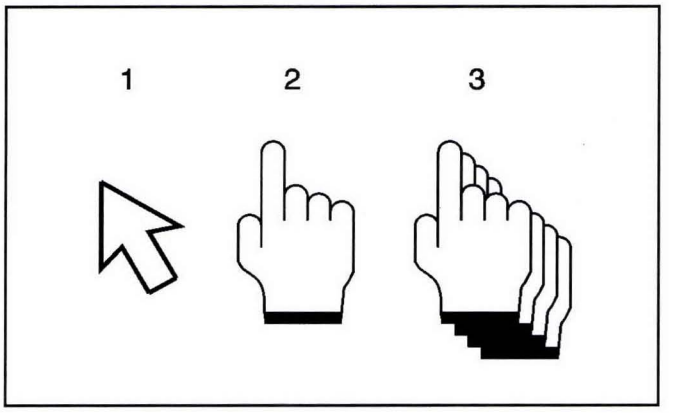
Electronic Delivery Navigation Features

The schematics information has been enhanced for electronic delivery and the following explains the features that are now available.

The enhanced features are categorized into three types:

- Mouse-overs, which are active when the mouse pointer is placed over the activated area
- Hotspots (links to other information), which are active by placing the mouse pointer over the activated area and clicking the left mouse button
- Hotspot Target Highlighting, which is when linking from one graphic to another graphic, the point of interest will be highlighted in red. This feature is available only when linking from a schematic graphic to a component locator/harness routing view, or when linking from a schematic to an electrical center identification view

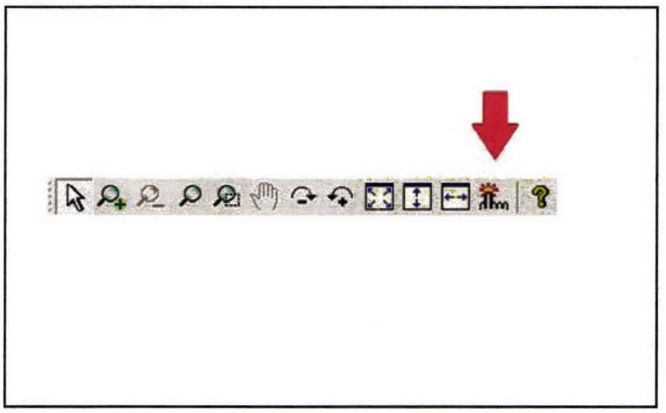
Depending on the amount of information that is linked to from a hotspot, the mouse pointer changes shape.



3819127

1. Basic mouse pointer – this means there are no hotspots available, but there may be a mouse-over available.
2. Single hand pointer – this means there is a mouse-over and hotspot link to a single document. Clicking on these areas will automatically take you to the target link.
3. Multiple hand pointer – this means there is a mouse-over and hotspot link to a multiple document. Clicking on these areas will bring up a pop-up menu that will display all available links. You may then select one of the available links clicking on one of the displayed links.

To see which areas of the schematic information have an available hotspot and/or a mouse-over, select and hold down the highlight hotspots button of the cgm viewer. This will highlight all areas of the graphic that have an available hotspot and/or a mouse-over in red. Once the button is released, the areas of the graphic will no longer be highlighted.



3819130

Each type of schematic related information has some level of these features. The schematic related information consists of the following information types:

- Schematics
- Connector End Views
- Component Locator Views
- Harness Routing Views
- Electrical Center Identification Views
- Master Electrical Component List
- Master Electrical Schematic Icons
- Schematics RPO Code List
- Circuit Number/Wire Colors
- Wire Lines
- Connector Cavities

Schematics

An electrical schematic hotspot is an activated icon or area in the schematic that can be cursor selected to link to additional information. Additionally, each of the hotspots in schematics has a mouse-over.

Hotspots in schematics are categorized into three types:

- Schematic Navigational Icon Hotspots
- Schematic Informational Icon Hotspots
- Schematic Navigational Hotspots

Schematic Navigational Icon Hotspots

The following lists icons that may appear on the upper right corner of a schematic that have an available mouse-over and hotspot.

Icon	Mouse-Over	Hotspot Link to Information
 1990537	Master Electrical Component List	Links to the vehicle Master Electrical Component List that shows all electrical components and harness items on the vehicle and has links to any available views
 1990538	Title of the subsystem description and operation	Links to the System Description and Operation

Icon	Mouse-Over	Hotspot Link to Information
 1988674	Control Module References	Links to the Control Module References table
 1990541	Title of the next schematic page	Links to the next schematic of the subsystem schematics
 1990542	Title of the previous schematic page	Links to the previous schematic of the subsystem schematics

Schematic Informational Icon Hotspots

The following lists the icons that may appear anywhere on a schematic that have an available mouse-over and hotspot.

Icon	Mouse-Over	Hotspot Link to Information
Danger  1988672	Master Electrical Schematic Icons	Links to the vehicle Master Electrical Schematic Icons list that describes the message for the icon.

Icon	Mouse-Over	Hotspot Link to Information
High Voltage  1988673	Master Electrical Schematic Icons	Links to the vehicle Master Electrical Schematic Icons list that describes the message for the icon.
Caution  1990543	Master Electrical Schematic Icons	Links to the vehicle Master Electrical Schematic Icons list that describes the message for the icon.
Supplemental Restraint  1988667	Master Electrical Schematic Icons	Links to the vehicle Master Electrical Schematic Icons list that describes the message for the icon.
Pedestrian Impact  3814889	Master Electrical Schematic Icons	Links to the vehicle Master Electrical Schematic Icons list that describes the message for the icon.

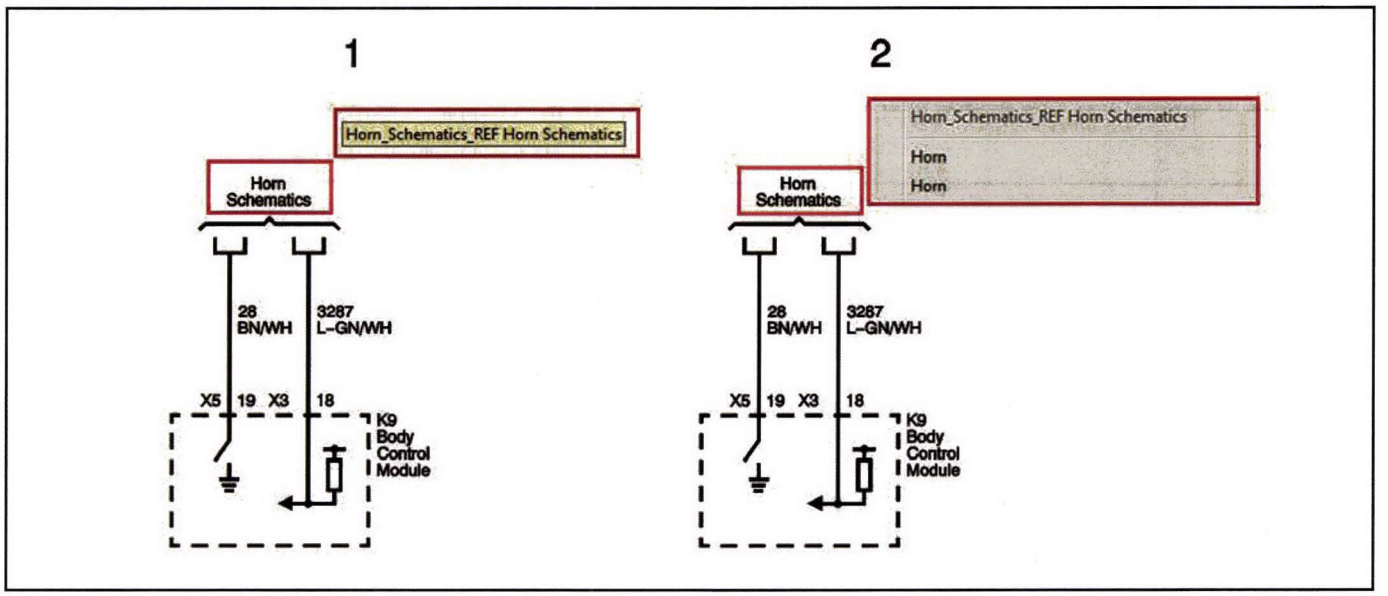
Icon	Mouse-Over	Hotspot Link to Information
Additional Information  1988670	Master Electrical Schematic Icons	Links to the vehicle Master Electrical Schematic Icons list that describes the message for the icon.

Schematic Navigational Hotspots

In addition to the navigational icons, schematics have other active hotspots that link to supporting information such as related schematics, component locator views, harness routing views, and connector end views.

These hotspots can be either text based or symbol based. The following are the items that will have a mouse-over and hotspot.

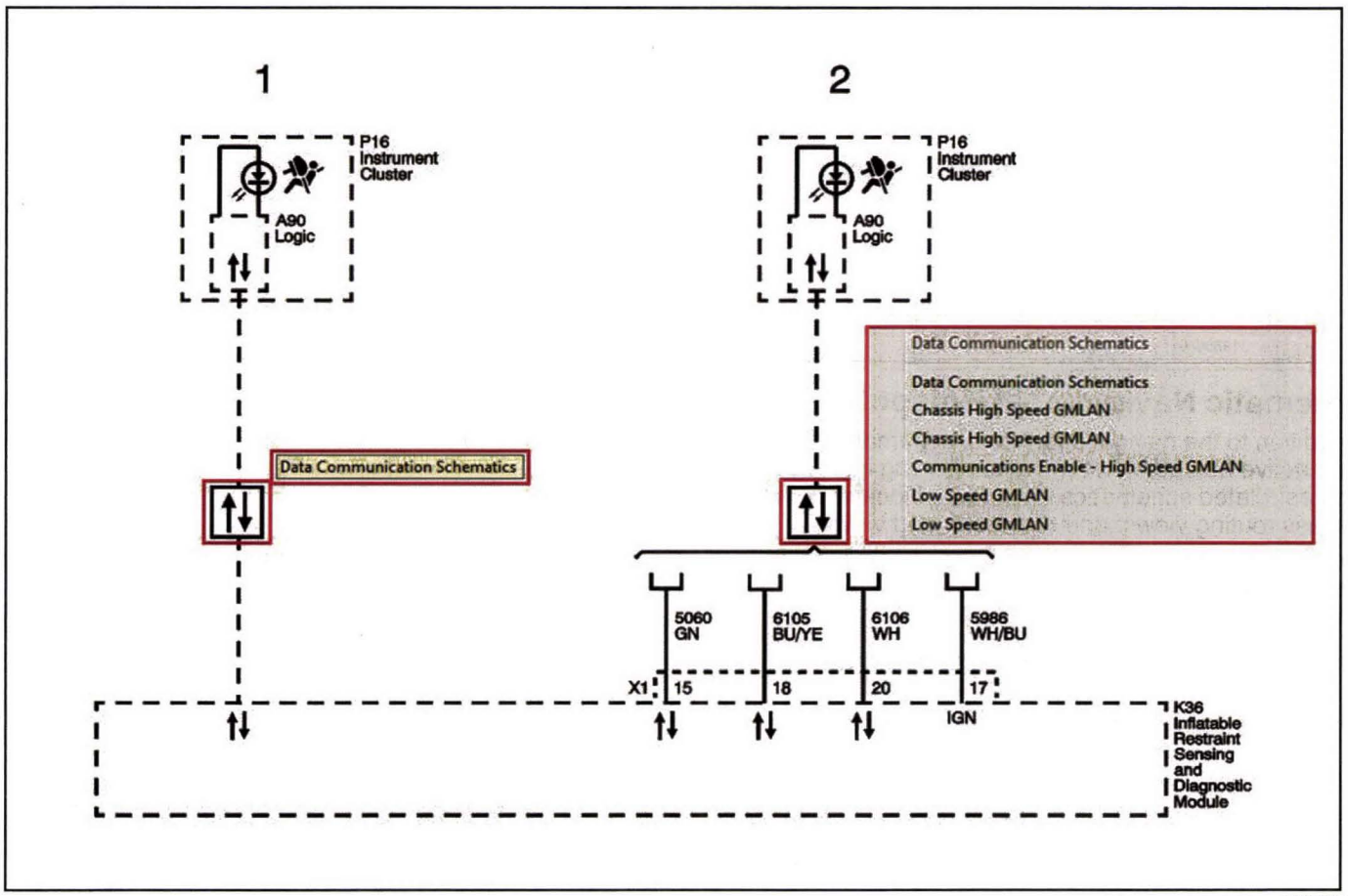
Schematic Title Circuit References



3814891

1. **Mouse-over:** Displays the title of the schematic page linked to.
2. **Hotspot Link to Information:** Links to the individual subsystem schematic page(s) that shows the circuit in detail. If multiple circuits are included, or if the circuit is shown in multiple schematics, a menu will appear when the link is selected. This menu includes links to all schematics that contain the same circuit number as the circuit being referenced. Additionally, when the target schematic is opened, the referenced circuit will be highlighted to draw visual attention. Note that when there are multiple target links, the links may appear to be duplicate in the menu, however, they are not. The exact same title is repeated for each circuit number that is pointing to the same target schematic. A future update will include the circuit number before the link description to further assist in link selection.

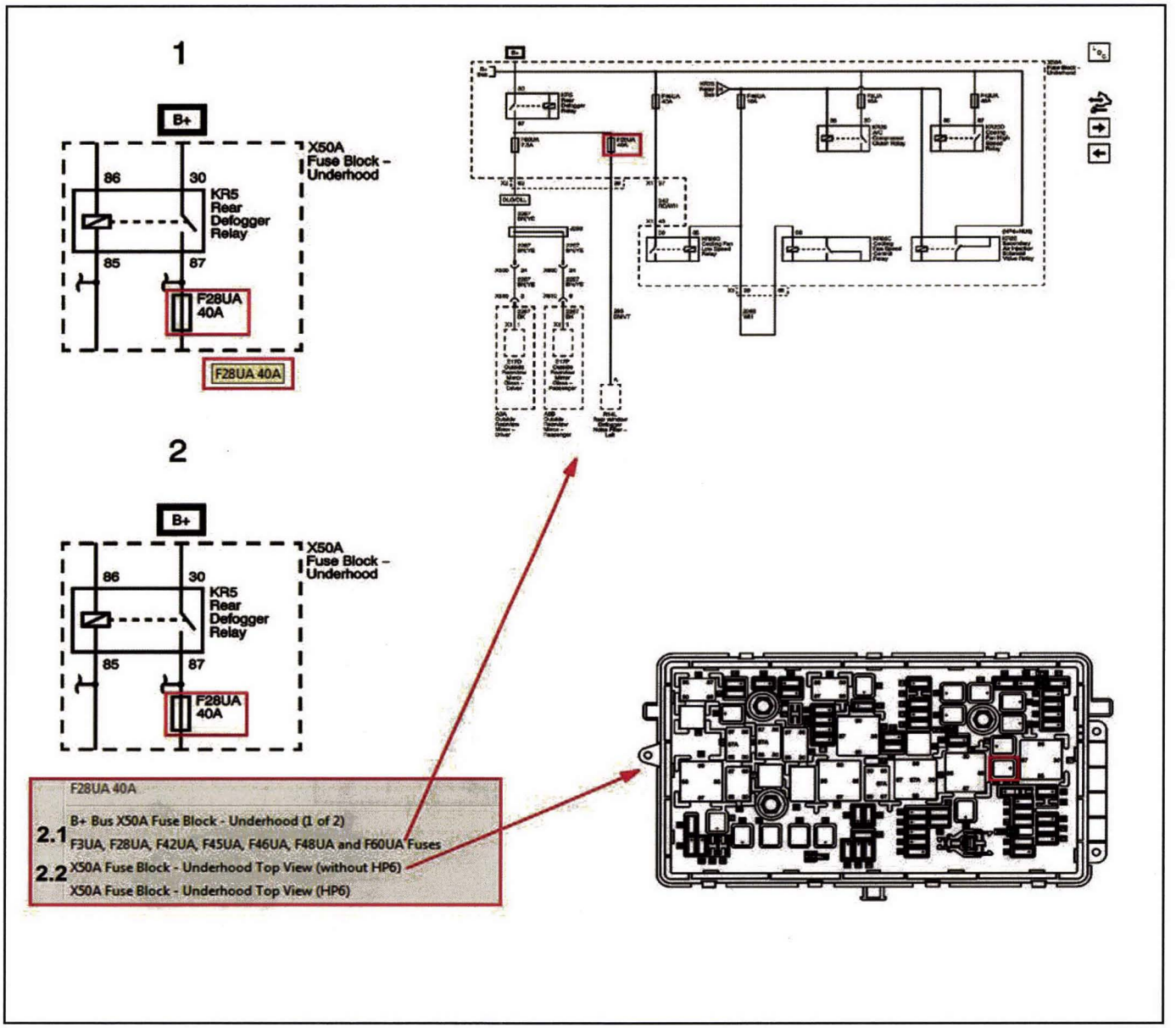
Serial Data Functional Circuit Icon



3818612

1. **Mouse-over:** Displays the schematic title Data Communication Schematics.
2. **Hotspot Link to Information:**
   - ⇒ When a dashed serial data wire and icon are shown without any circuit numbers, the serial data circuit icon will link to the complete list of Data Communication schematic pages, and not a specific schematic. This is due to no circuit numbers are shown.
   - ⇒ When a circuit wire(s) are shown with circuit numbers, a menu will appear when the link is selected. This menu includes links to the list of Data Communication schematic pages as well as links to the individual schematics that contain the same circuit number as the circuit being referenced. Additionally, when the target schematic is opened, the referenced circuit will be highlighted to draw visual attention. Note that when there are multiple target links, the links may appear to be duplicate in the menu, however, they are not. The exact same title is repeated for each circuit number that is pointing to the same target schematic. A future update will include the circuit number before the link description to further assist in link selection.

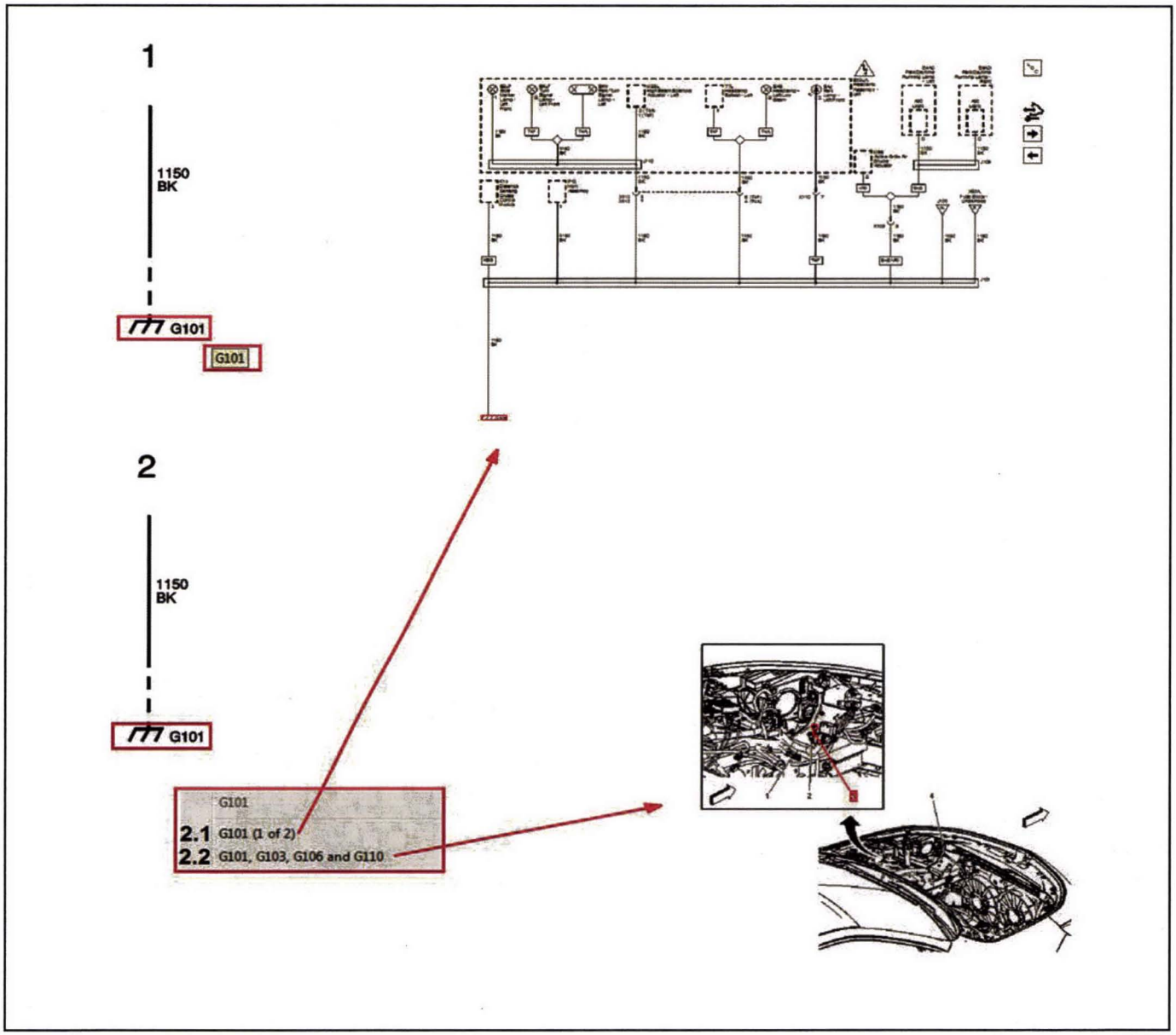
Fuse/Circuit Breaker Symbol and Name within Subsystem Schematics



3818725

1. **Mouse-over:** Displays the code and the amperage of the protection device.
2. **Hotspot Link to Information:**
   - ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   - 2.1. Links to the individual schematic page(s) within the Power Distribution Schematics where the circuits are shown in detail. Additionally, when the target schematic is opened, the circuit protection device will be highlighted to draw visual attention.
   - 2.2. Links to individual fuse block top or bottom view(s) within the Electrical Center Identification Views and will show where the device is located in the fuse block. Additionally, when the target view is opened, the device outline will be highlighted for visual attention.

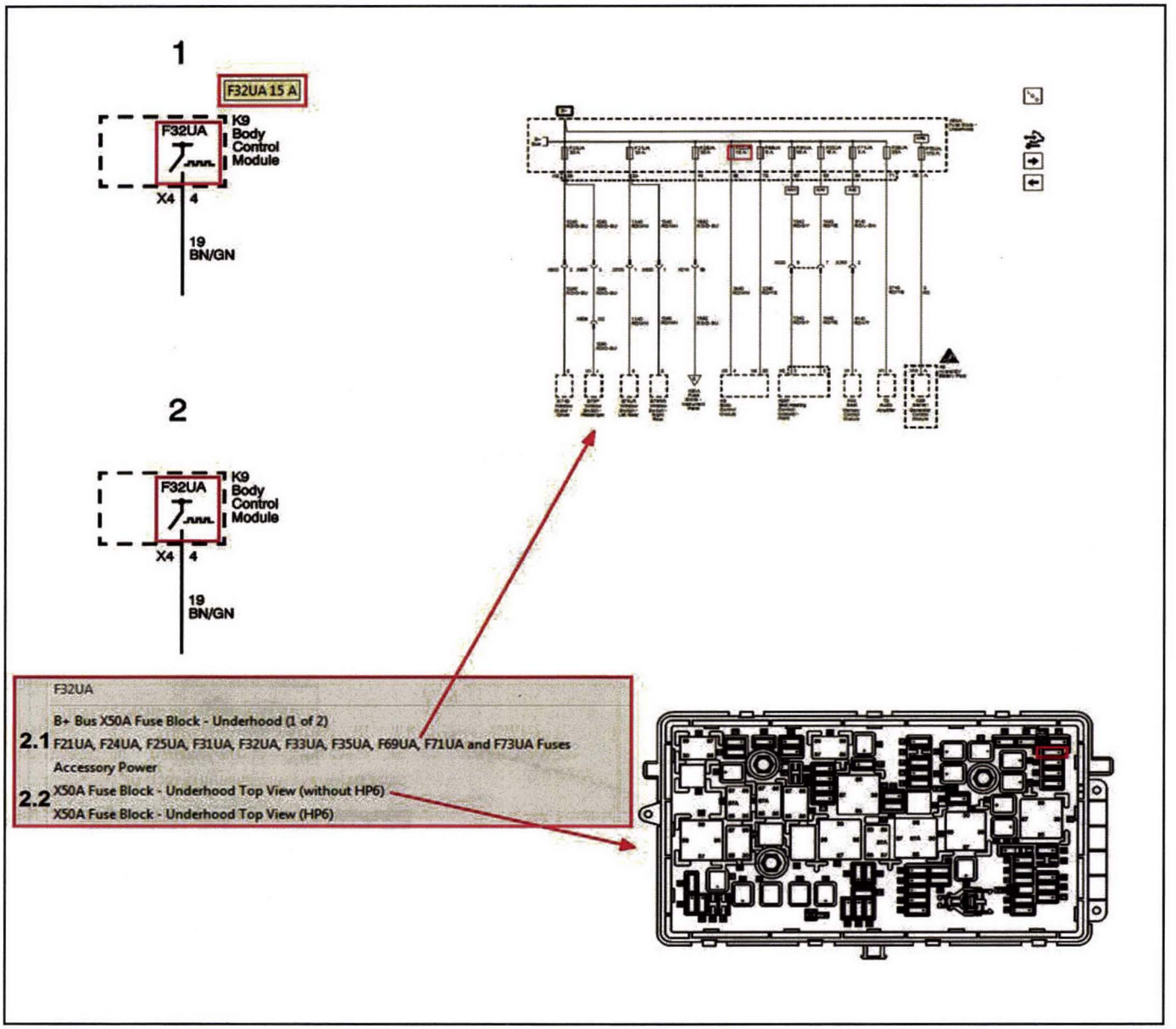
Ground Symbol/Name in Subsystem Schematics



3818918

1. **Mouse-over:** Displays the ground number.
2. **Hotspot Link to Information:**
   - ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   - 2.1. Links to the individual schematic page(s) within the Ground Distribution Schematics where the circuits are shown in detail. Additionally, when the target schematic is opened, the ground will be highlighted to draw visual attention.
   - 2.2. Links to the individual locator view(s) within the Ground Views and will show where the ground is located on the vehicle. Additionally, when the target view is opened, the ground and callout leader line/number will be highlighted to draw visual attention.

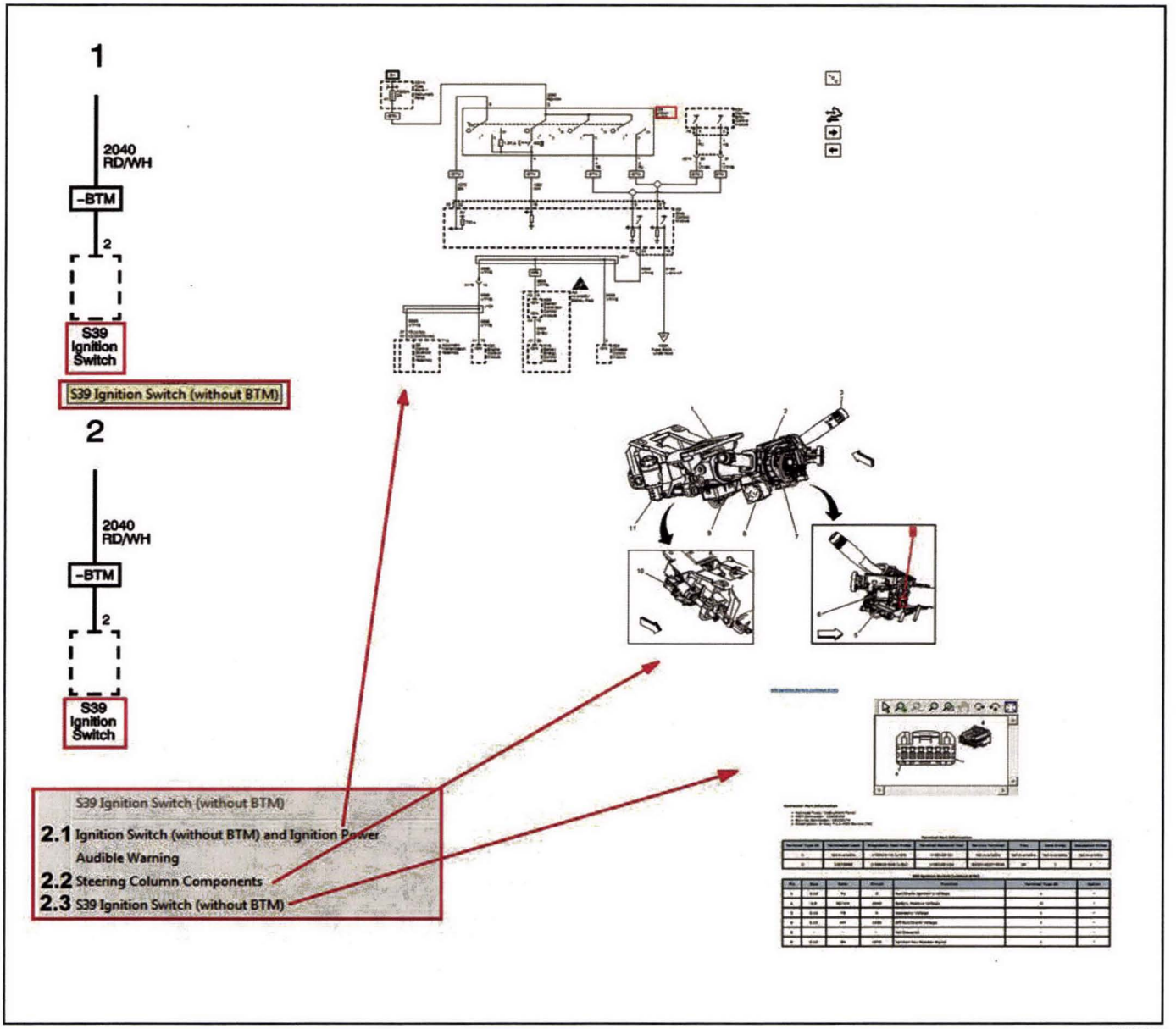
Body Control Module High-Side Driver Output Symbol/Driver Source Fuse Name in Subsystem Schematics



3819026

1. **Mouse-over:** Displays the code of the protection device that supplies the high-side driver output circuit.
2. **Hotspot Link to Information:**
   - ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   - 2.1. Links to the individual schematic page(s) within the Power Distribution Schematics where the circuits are shown in detail. Additionally, when the target schematic is opened, the circuit protection device will be highlighted to draw visual attention.
   - 2.2. Links to individual fuse block top or bottom view(s) within the Electrical Center Identification Views and will show where the device is located in the fuse block. Additionally, when the target view is opened, the device outline will be highlighted for visual attention.

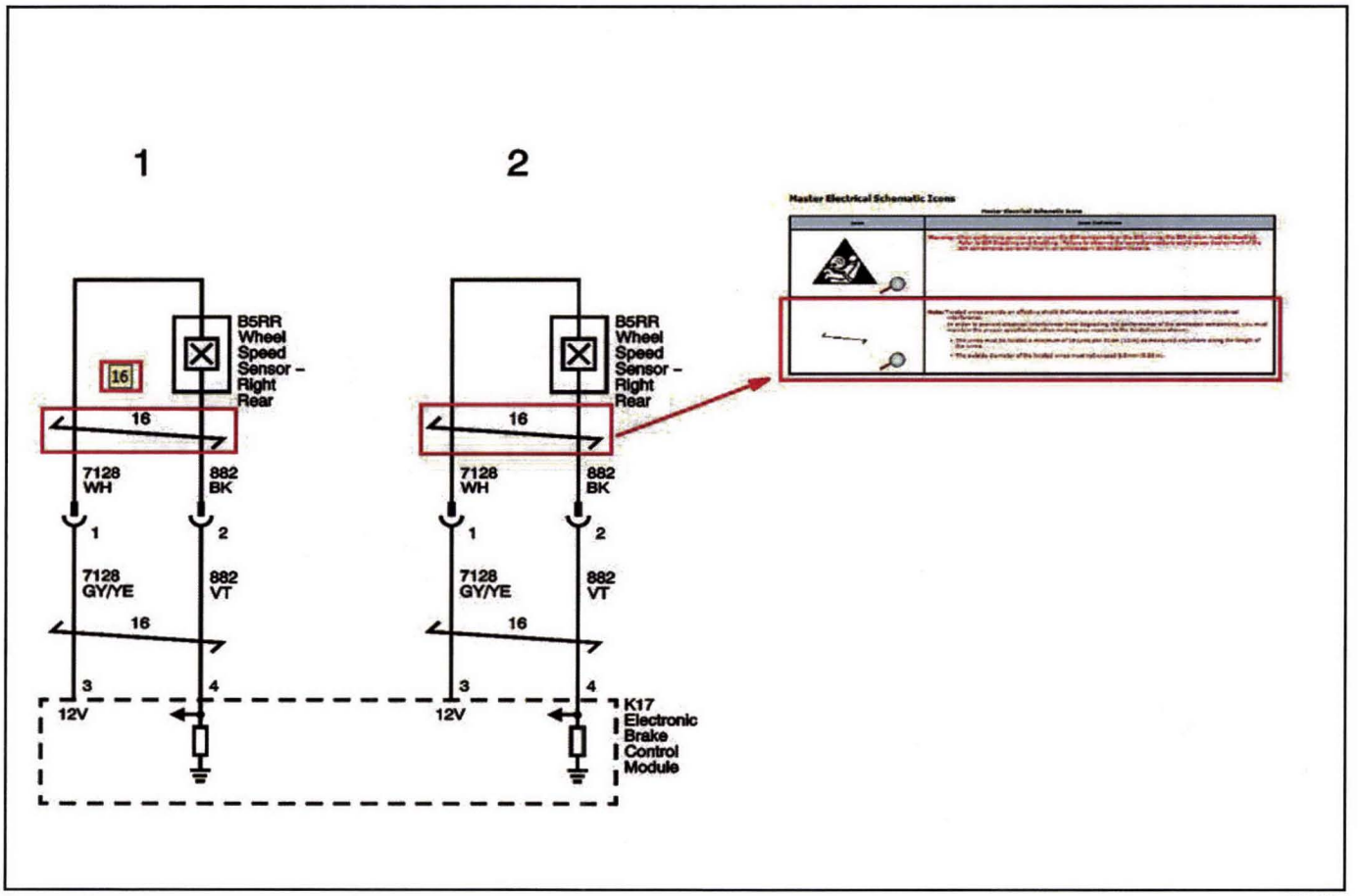
Component Name in Power and Ground Distribution Schematics



3819063

1. **Mouse-over:** Displays the code and name of the component.
2. **Hotspot Link to Information:**
   ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   2.1. Links to the individual schematic page(s) within the Subsystem Schematic(s) where the circuits are shown in detail. Additionally, when the target schematic is opened, the component code and name will be highlighted to draw visual attention.
   2.2. Links to the individual locator view(s) within the applicable component view category and will show where the component is located on the vehicle. Additionally, when the target view is opened, the component and callout leader line/number will be highlighted to draw visual attention.
   2.3. Links to individual connector end view(s) within the Component Connector End Views.

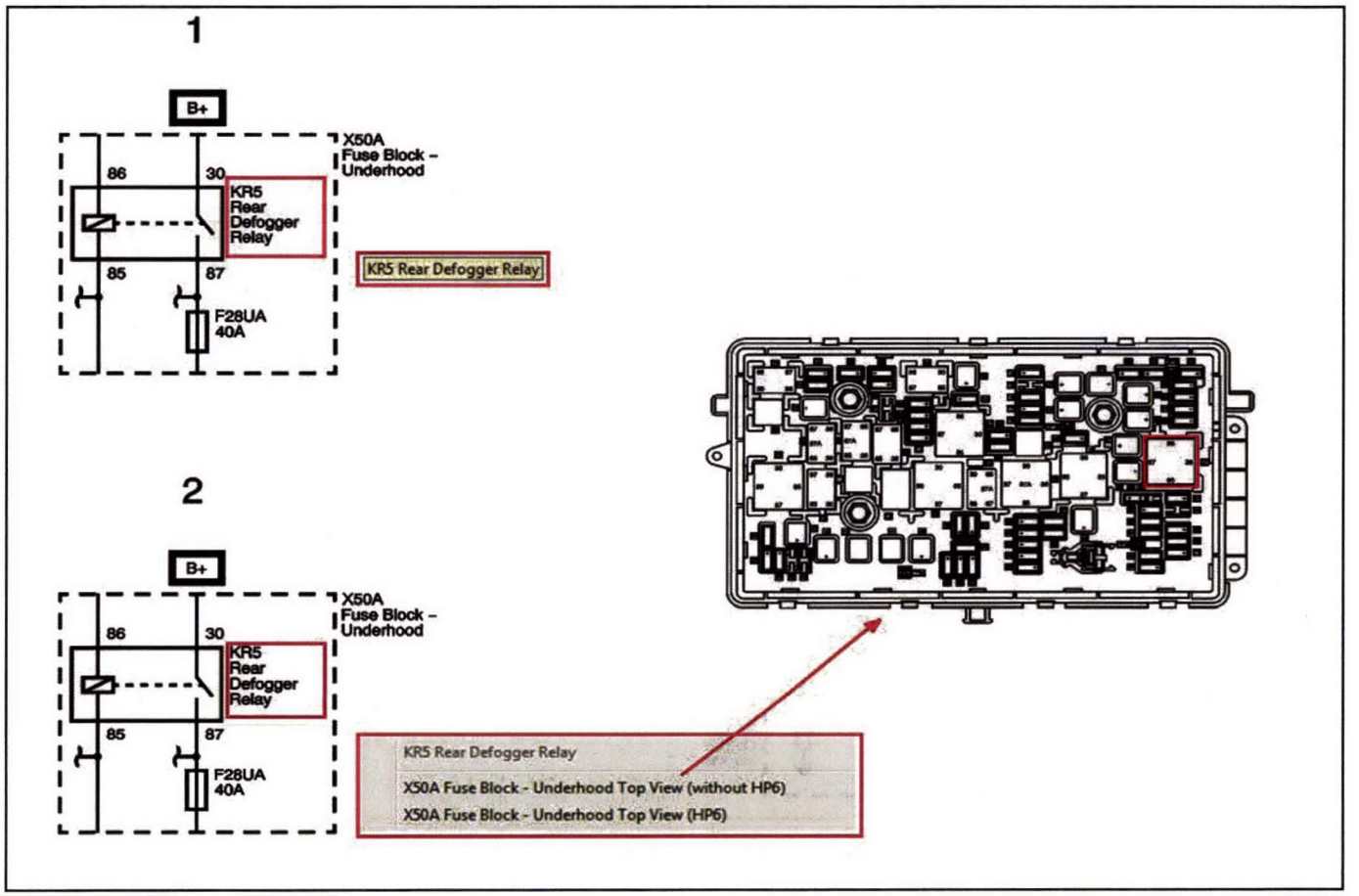
Twisted Pair Symbols



3819064

1. **Mouse-over:** Displays the repair specification for the number of twists of the wire within the specified distance.
2. **Hotspot Link to Information:** Links to the Master Electrical Schematic Icons list that shows the icon along with the repair specification details for the wire.

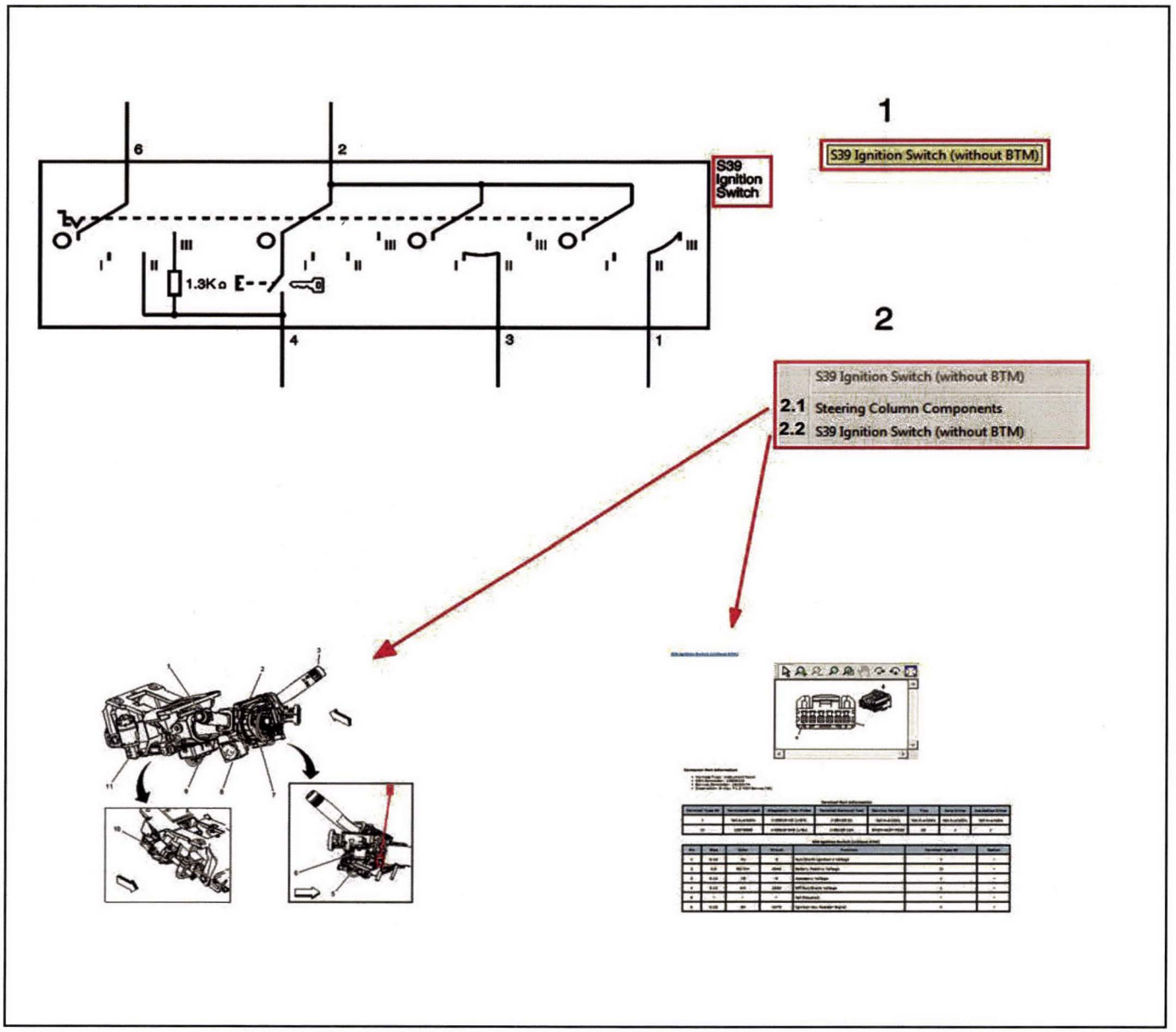
Relay Name (located within a block)



3819124

1. **Mouse-over:** Displays the relay code and name.
2. **Hotspot Link to Information:** Links to individual fuse block top or bottom view(s) within the Electrical Center Identification Views and will show where the device is located in the fuse block. Additionally, when the target view is opened, the device outline will be highlighted for visual attention.

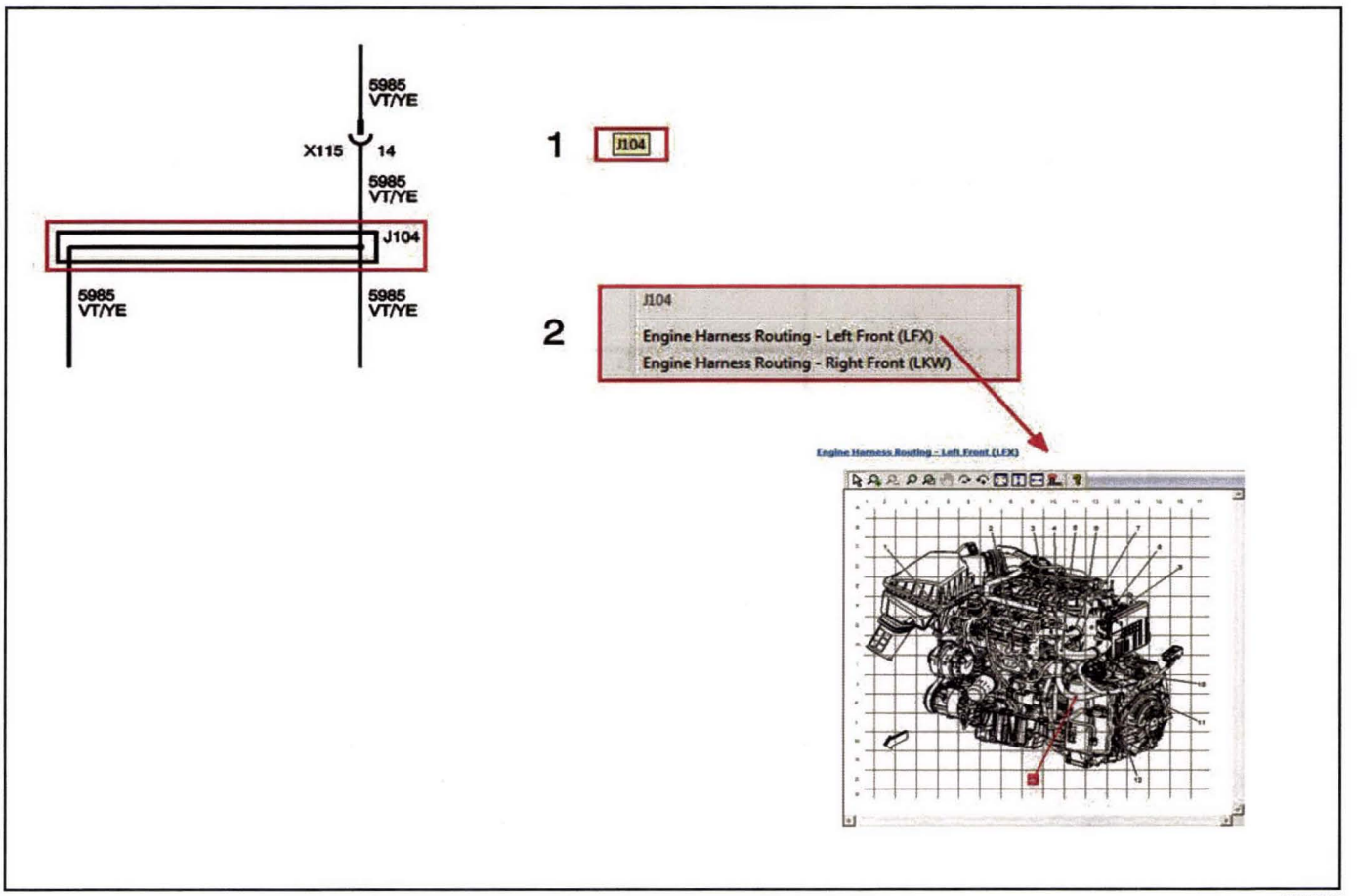
Component Name in Subsystem Schematics



3819141

1. **Mouse-over:** Displays the code and name of the component.
2. **Hotspot Link to Information:**
   - ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   - 2.1. Links to the individual locator view(s) within the applicable component view category and will show where the component is located on the vehicle. Additionally, when the target view is opened, the component and callout leader line/number will be highlighted to draw visual attention.
   - 2.2. Links to individual connector end view(s) within the Component Connector End Views.

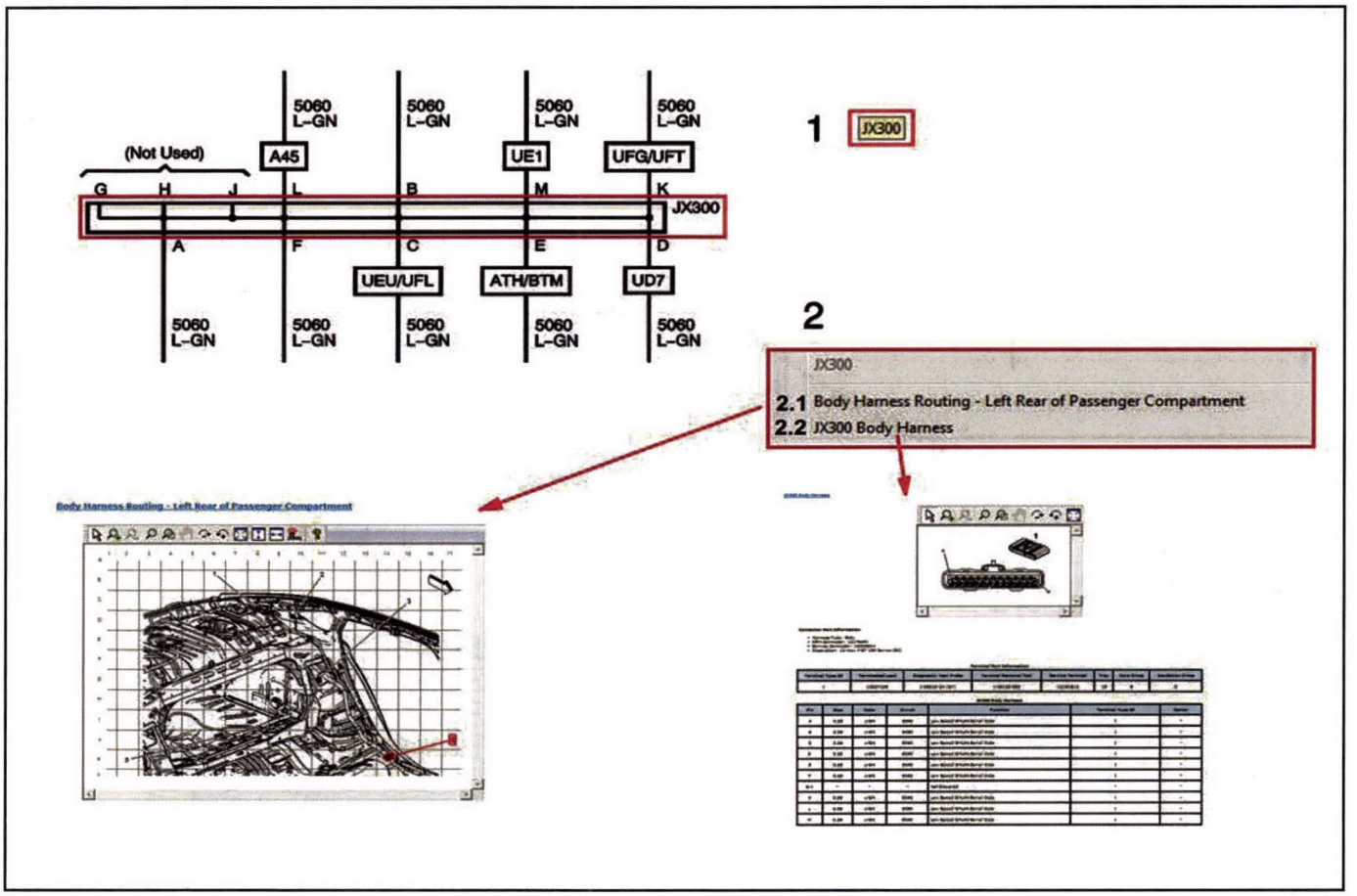
Splice Names



3819287

1. **Mouse-over:** Displays the code of the harness splice.
2. **Hotspot Link to Information:** Links to the individual harness routing view(s) within the Harness Routing Views and will show where the harness item is located on the vehicle harness. Additionally, when the target view is opened, the harness item and callout leader line/number will be highlighted to draw visual attention.

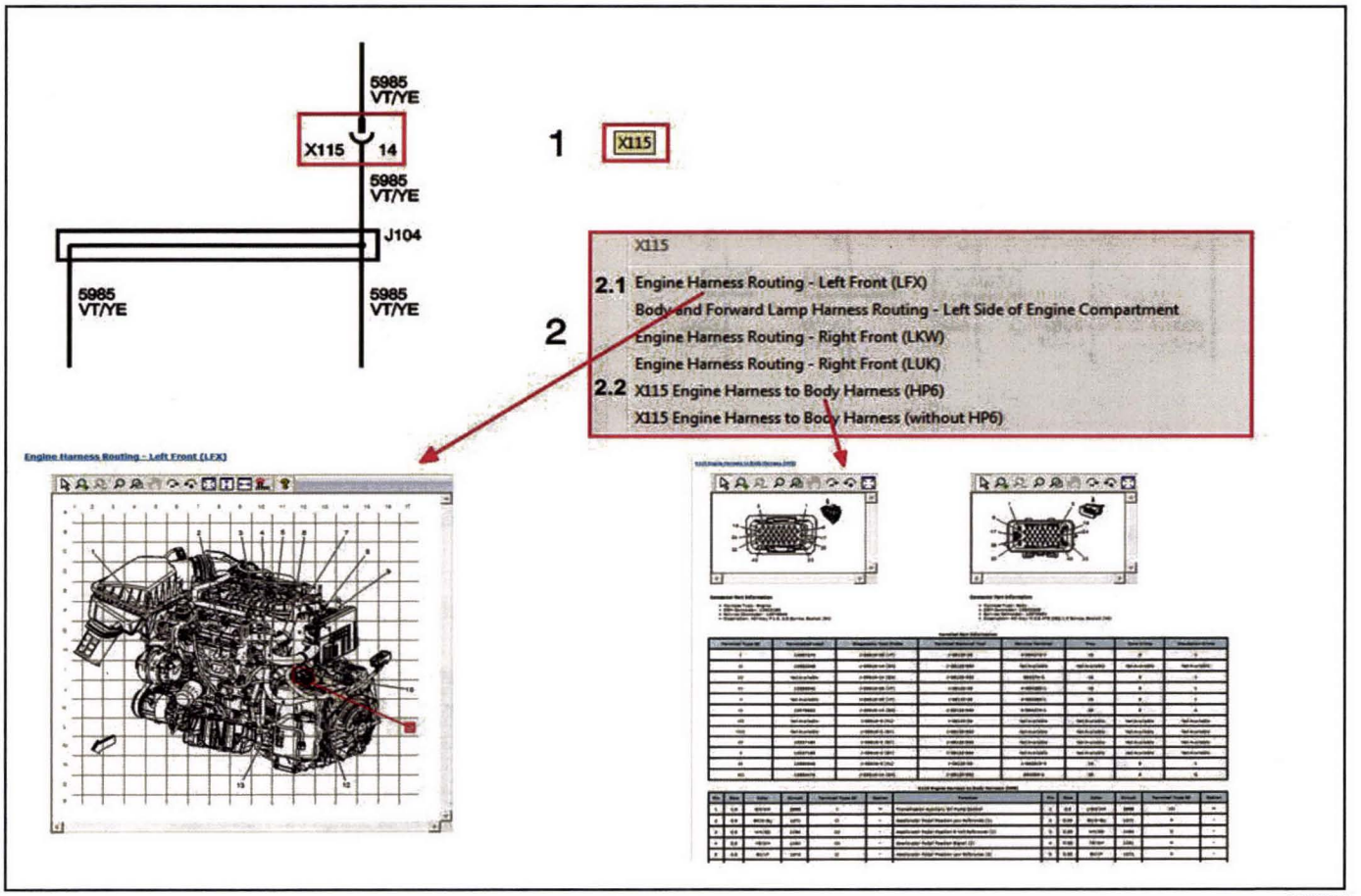
Splice Pack Names



3819454

1. **Mouse-over:** Displays the code of the harness splice pack.
2. **Hotspot Link to Information:**
   ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   2.1. Links to the individual harness routing view(s) within the Harness Routing Views and will show where the harness item is located on the vehicle harness. Additionally, when the target view is opened, the harness item and callout leader line/number will be highlighted to draw visual attention.
   2.2. Links to individual connector end view(s) within the Splice Pack Connector End Views.

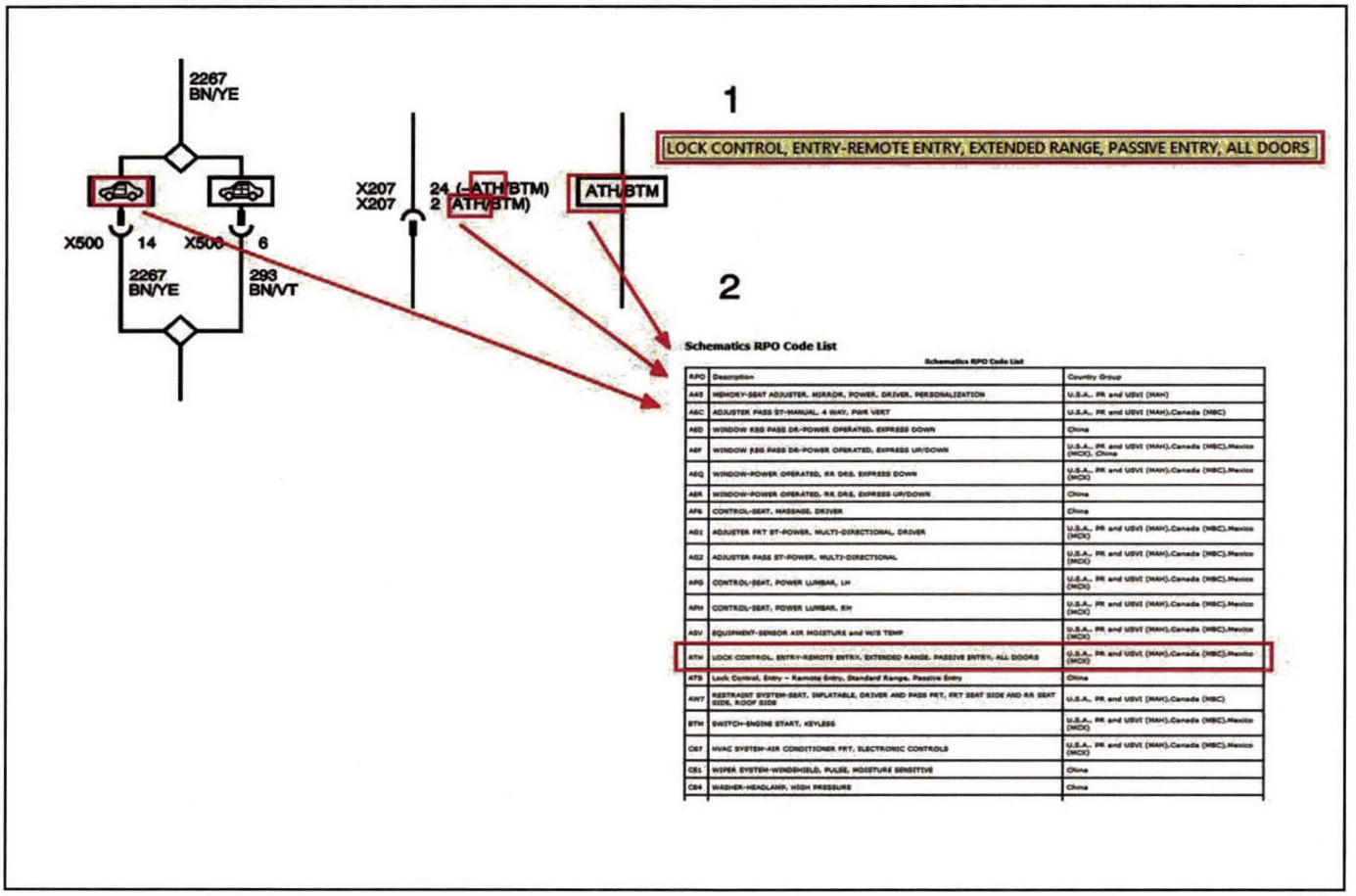
Inline Harness Connector Names



3819345

1. **Mouse-over:** Displays the code of the inline harness connector.
2. **Hotspot Link to Information:**
   - ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   - 2.1. Links to the individual harness routing view(s) within the Harness Routing Views and will show where the harness item is located on the vehicle harness. Additionally, when the target view is opened, the harness item and callout leader line/number will be highlighted to draw visual attention.
   - 2.2. Links to individual connector end view(s) within the Inline Harness Connector End Views.

Regular Production Option (RPO) Codes/Icons



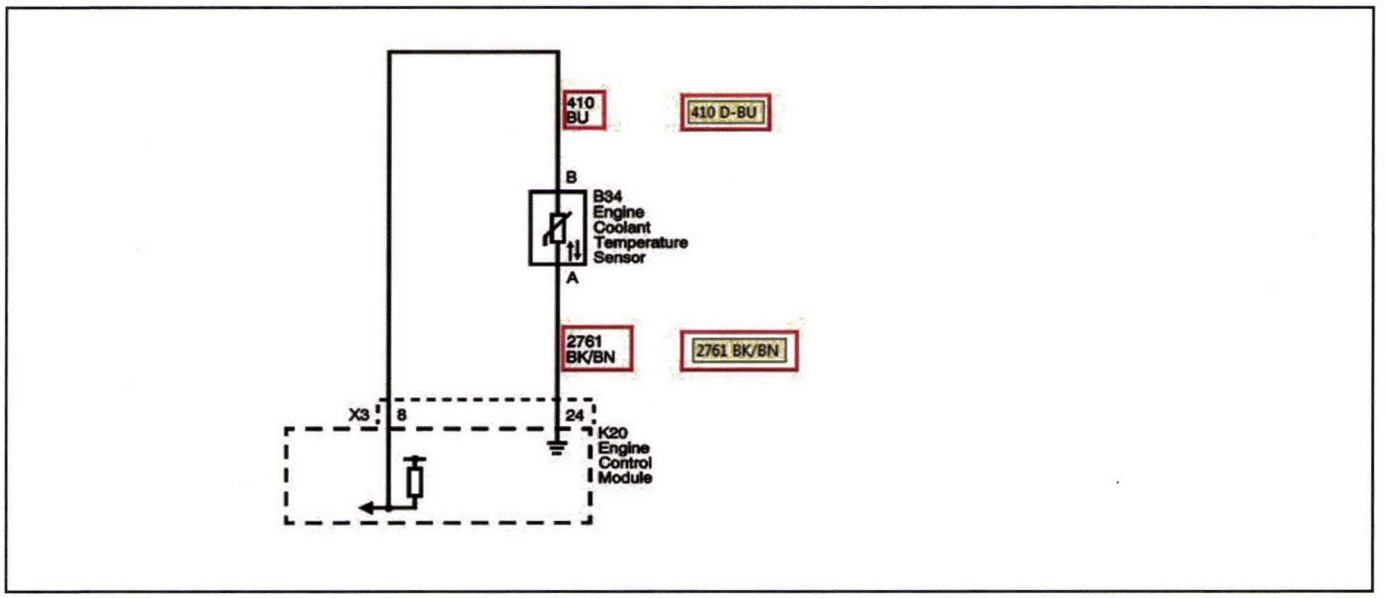
Schematics RPO Code List

RPO	Description	Country Group
A4S	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION	U.S.A., PR and USVI (MAH)
A6C	ADJUSTER PASS ST-MANUAL, 4 WAY, PWR VERT	U.S.A., PR and USVI (MAH),Canada (MBC)
A6D	WINDOW REG PASS DR-POWER OPERATED, EXPRESS DOWN	China
A6F	WINDOW REG PASS DR-POWER OPERATED, EXPRESS UP/DOWN	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCK), China
A6Q	WINDOW-POWER OPERATED, RR DRS, EXPRESS DOWN	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCK)
A6R	WINDOW-POWER OPERATED, RR DRS, EXPRESS UP/DOWN	China
AF6	CONTROL-SEAT, MASSAGE, DRIVER	China
AG1	ADJUSTER FRT ST-POWER, MULTI-DIRECTIONAL, DRIVER	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCK)
AG2	ADJUSTER PASS ST-POWER, MULTI-DIRECTIONAL	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCK)
AP5	CONTROL-SEAT, POWER LUMBAR, LH	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCK)
AP6	CONTROL-SEAT, POWER LUMBAR, RH	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCK)
AQV	EQUIPMENT-SENSOR AIR MOISTURE and W/S TEMP	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCK)
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCK)
ATS	Lock Control, Entry – Remote Entry, Standard Range, Passive Entry	China
AW7	RESTRAINT SYSTEM-SEAT, INFLATABLE, DRIVER AND PASS FRT, FRT SEAT SIDE AND RR SEAT SIDE, ROOF SIDE	U.S.A., PR and USVI (MAH),Canada (MBC)
BTM	SWITCH-ENGINE START, KEYLESS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCK)
C67	HVAC SYSTEM-AIR CONDITIONER FRT, ELECTRONIC CONTROLS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCK)
CE1	WIPER SYSTEM-WINDSHIELD, PULSE, MOISTURE SENSITIVE	China
CE4	WASHER-HEADLAMP, HIGH PRESSURE	China

3819777

1. **Mouse-over:** Displays the description of the RPO code as well as the country group names where the option is possible to order. Note that each RPO shown will have its own mouse-over and description. Also note that the mouse-over does not include any symbols indicating with (shown as a + sign if combined option) or without (shown as a – sign to mean without/except).
2. **Hotspot Link to Information:** Links to the Schematics RPO Code List that shows the RPO, the description of the option, and the country group names where the option is possible to order.

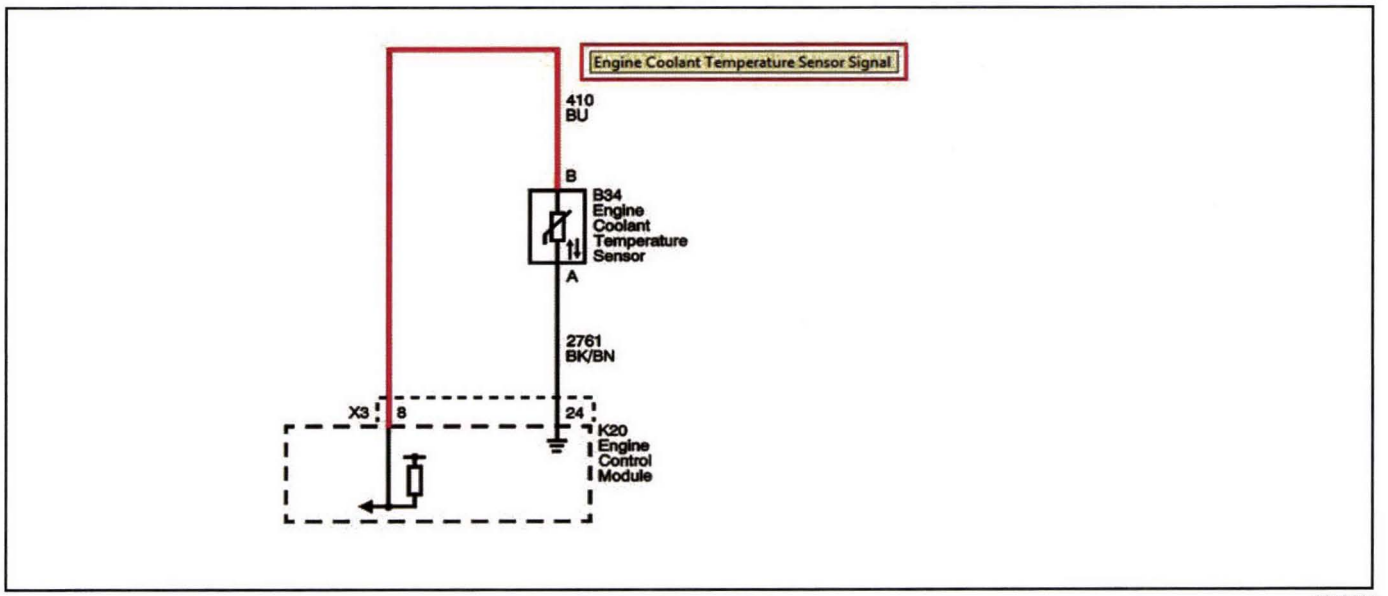
Circuit Number/Wire Colors



3819880

1. **Mouse-over:** Displays the circuit number (if shown) and the color abbreviation of the wire insulation. Refer to Color Abbreviations for an explanation of each wire color abbreviation. A future update may spell out the wire colors in all languages.
2. **Hotspot Link to Information:** None at this time.

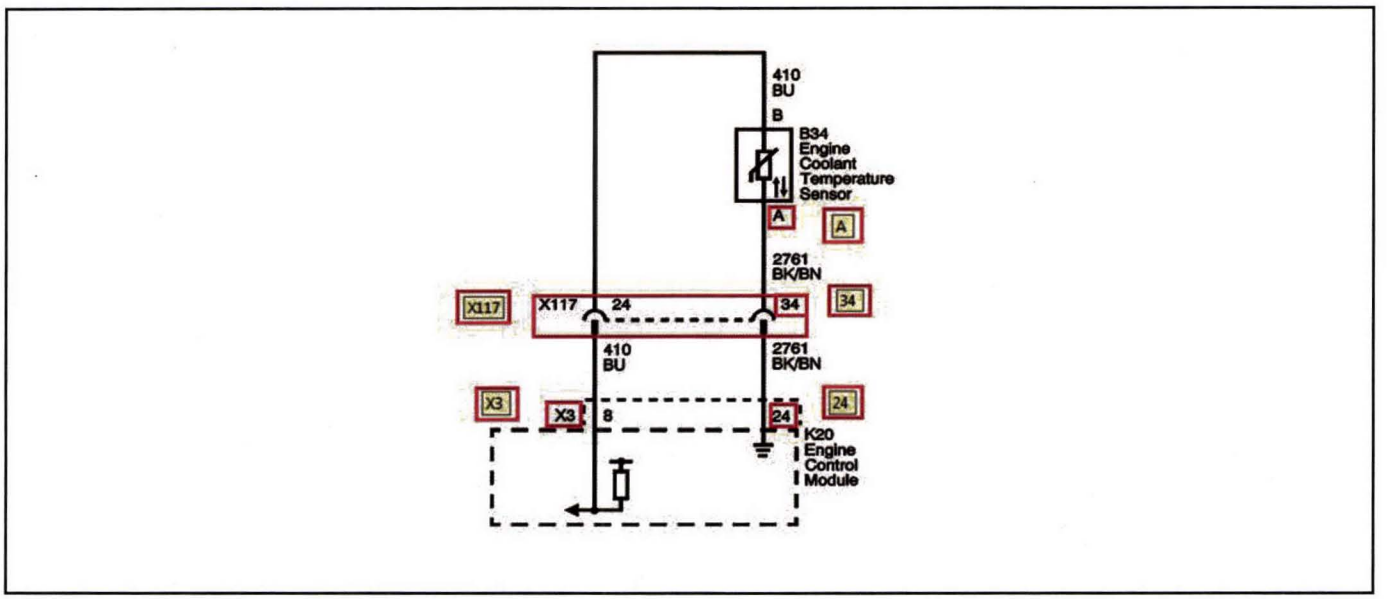
Wire Lines



3819888

1. **Mouse-over:** Displays the circuit function of the wire as used on the vehicle. This same function is shown in the connector end view pinout table for the component the wire connects. Note if there is no circuit number shown, the circuit will not have an associated mouse-over.
2. **Hotspot Link to Information:** None at this time. A future update may include links to harness routing views to show the routing of the circuit within the vehicle harness.

Connector Identifiers and Cavities

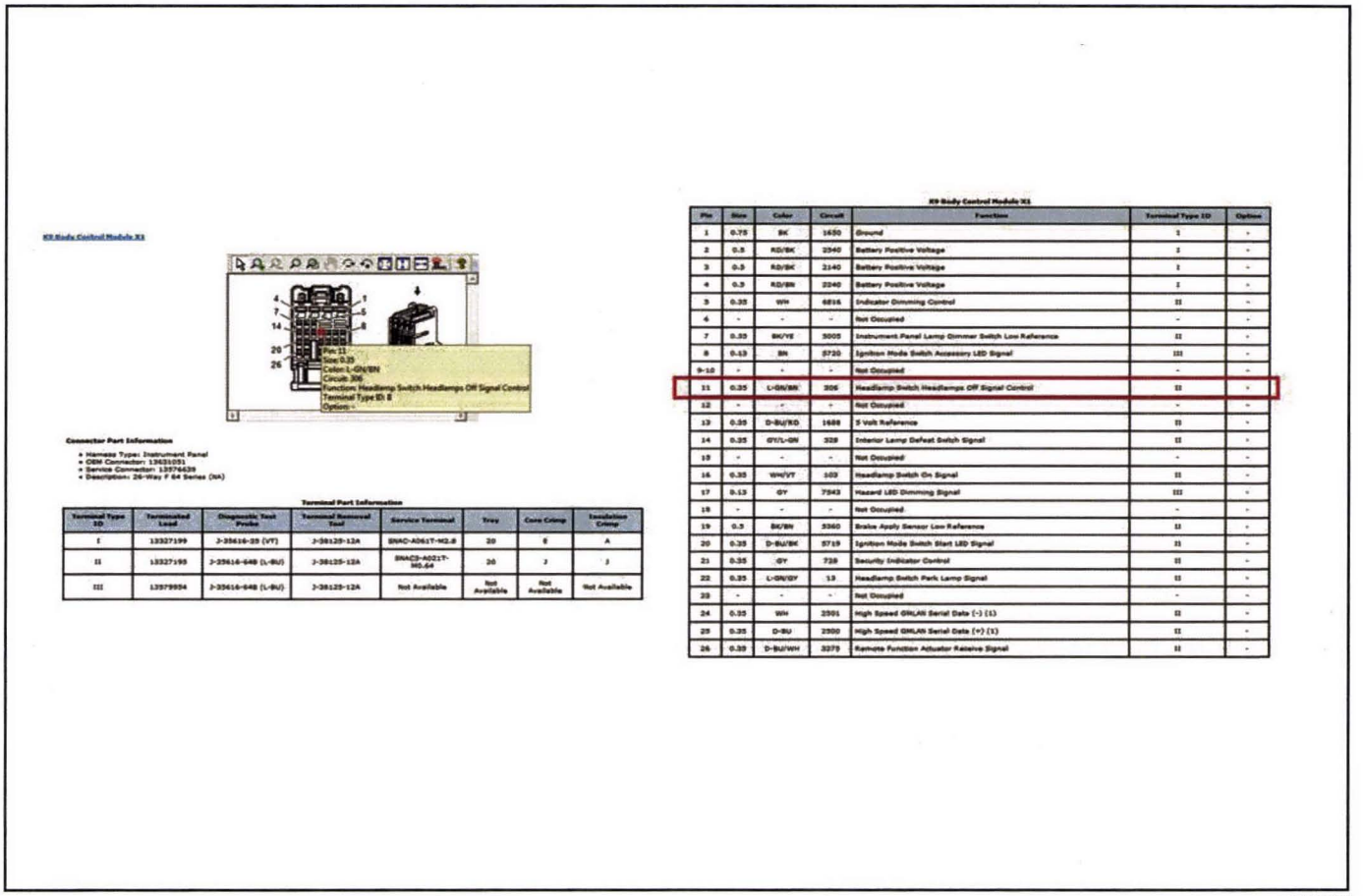


3819889

1. **Mouse-over:** Displays the cavity (pin) identifier (letter/number) for the connection at the component or inline harness connection.
2. **Hotspot Link to Information:** None at this time.

Connector End Views

Connector end view graphics now have mouse-overs to show the wire details of each of the populated cavities. Additionally, the terminal part information has been restructured into an easier to read table.



Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	BK	1650	Ground	I	-
2	0.5	RD/BK	2540	Battery Positive Voltage	I	-
3	0.5	RD/BK	2140	Battery Positive Voltage	I	-
4	0.5	RD/BN	2240	Battery Positive Voltage	I	-
5	0.35	WH	6816	Indicator Dimming Control	II	-
6	-	-	-	Not Occupied	-	-
7	0.35	BK/YE	5005	Instrument Panel Lamp Dimmer Switch Low Reference	II	-
8	0.13	BN	5720	Ignition Mode Switch Accessory LED Signal	III	-
9-10	-	-	-	Not Occupied	-	-
11	0.35	L-GN/BN	306	Headlamp Switch Headlamps Off Signal Control	II	-
12	-	-	-	Not Occupied	-	-
13	0.35	D-BU/RD	1688	5 Volt Reference	II	-
14	0.35	GY/L-GN	329	Interior Lamp Defeat Switch Signal	II	-
15	-	-	-	Not Occupied	-	-
16	0.35	WH/VT	103	Headlamp Switch On Signal	II	-
17	0.13	GY	7943	Hazard LED Dimming Signal	III	-
18	-	-	-	Not Occupied	-	-
19	0.5	BK/BN	5360	Brake Apply Sensor Low Reference	II	-
20	0.35	D-BU/BK	5719	Ignition Mode Switch Start LED Signal	II	-
21	0.35	GY	728	Security Indicator Control	II	-
22	0.35	L-GN/GY	13	Headlamp Switch Park Lamp Signal	II	-
23	-	-	-	Not Occupied	-	-
24	0.35	WH	2501	High Speed GMLAN Serial Data (-) (1)	II	-
25	0.35	D-BU	2500	High Speed GMLAN Serial Data (+) (1)	II	-
26	0.35	D-BU/WH	3275	Remote Function Actuator Relative Signal	II	-

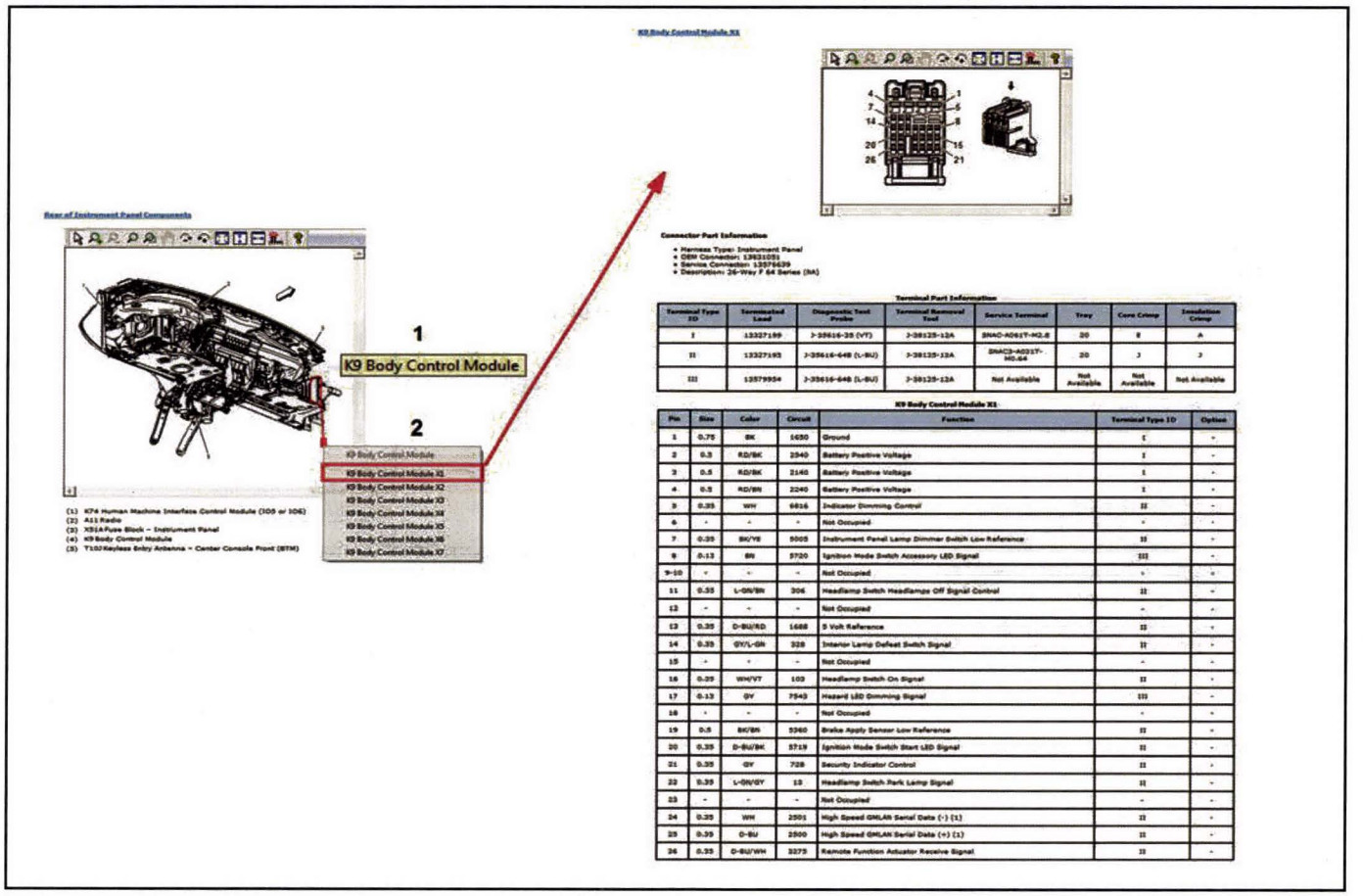
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327199	J-35616-35 (VT)	J-38125-12A	SNAC-A061T-M2.8	20	E	A
II	13327198	J-35616-64B (L-BU)	J-38125-12A	SNAC3-A021T-M0.64	30	J	J
III	13579934	J-35616-64B (L-BU)	J-38125-12A	Not Available	Not Available	Not Available	Not Available

3819951

1. **Mouse-over:** Displays all of the pinout table information for each column including Pin, Size, Color, Circuit, Function, Terminal Type ID, and Option. Note, that not used/not occupied cavities will not have a mouse-over at all. For not used/not occupied cavities, the connector graphic will appear to have a mouse-over, but no information will be displayed in a pop-up menu.
2. **Hotspot Link to Information:** None at this time. A future update may include links to individual subsystem schematic(s) for each circuit.

Component Locator Views

Component locator views now have links to component connector end views.

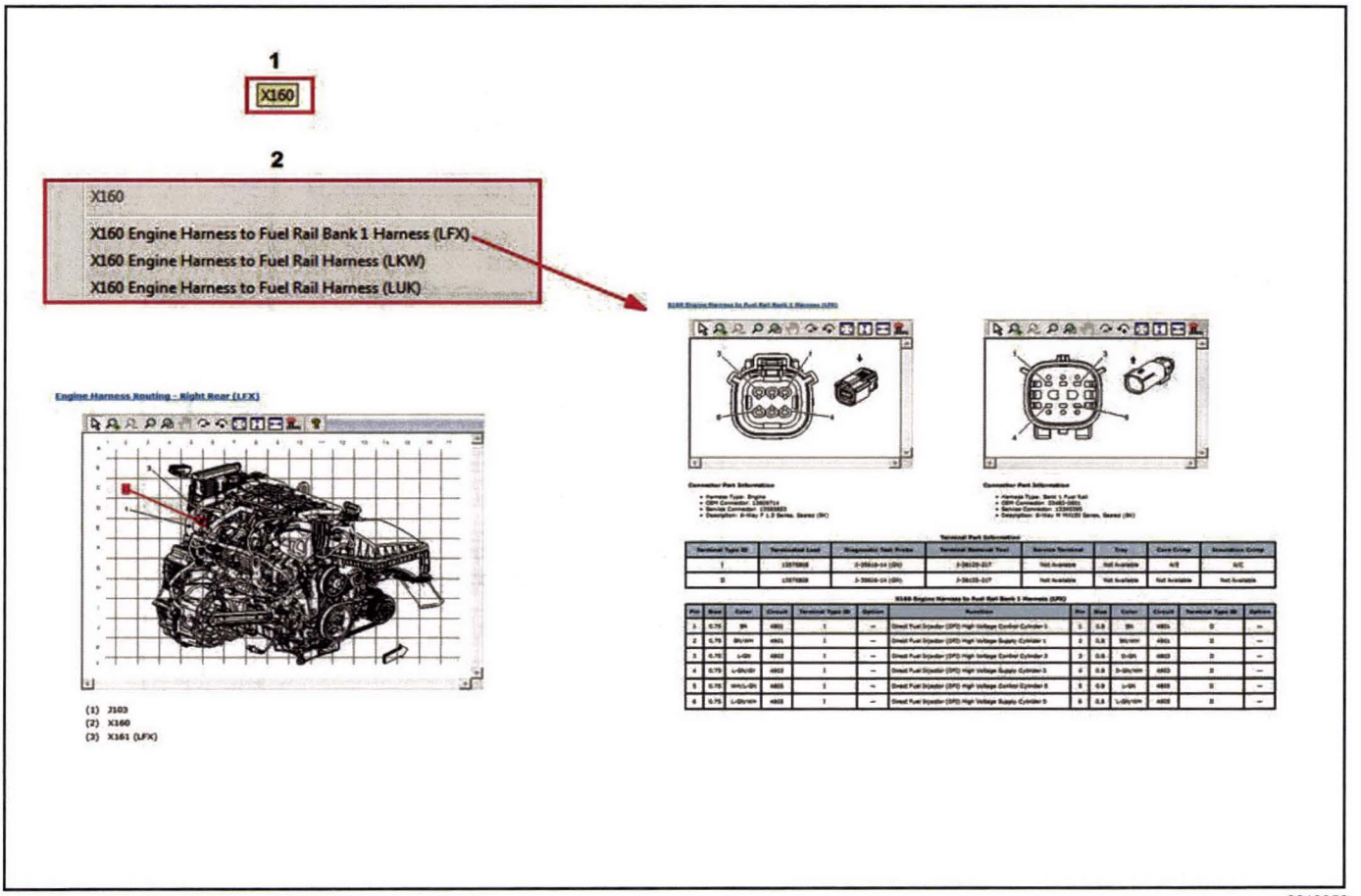


3819952

1. **Mouse-over:** Displays the code and name of the component.
2. **Hotspot Link to Information:** Links to individual connector end view(s) within Component Connector End Views.

Harness Routing Views

Harness routing views now have links to splice pack and inline harness connector end views.

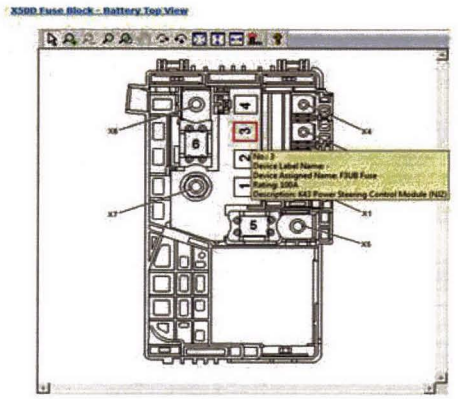


3819958

1. **Mouse-over:** Displays the code of the harness item.
2. **Hotspot Link to Information:** Links to individual splice pack connector end view(s) within Splice Pack Connector End Views for splice packs and to the individual inline harness connector end view(s) within Inline Harness Connector End Views for inline harness connectors.

Electrical Center Identification Views

Electrical center identification views (top and bottom/ front and back) graphics now have mouse-overs to show the function details of each of utilized devices. Note that the label view will not have any mouse-overs or links at all.



X50D Fuse Block - Battery Usage

No.	Device Label Name	Device Assigned Name	Rating	Description
1	-	F1UB Fuse	60A	X51A Fuse Block - Instrument Panel
2	-	F2UB Fuse	60A	X51A Fuse Block - Instrument Panel
3	-	F3UB Fuse	100A	K43 Power Steering Control Module (N32)
4	-	F4UB Fuse	80A	K43 Power Steering Control Module (N31)
5	-	F5UB Fuse	250A	X50A Fuse Block - Underhood
6	-	F6UB Fuse	300A	G13 Generator (without HP6), M64 Starter Motor

3820005

1. **Mouse-over:** Displays all of the usage table information for each column including No., Device Label Name, Device Assigned Name, Rating, and Description. Note, that not used/not occupied devices will not have a mouse-over at all. For not used/not occupied devices, the device graphic may appear to have a mouse-over, but no information will be displayed in a pop-up screen.
2. **Hotspot Link to Information:** None at this time.

Master Electrical Component List

While the master electrical component list format has not changed, it will continue to have links to component locator, harness routing, and connector end views for each of the available electrical devices within the vehicle.

Master Electrical Component List

Master Electrical Component List

Code	Name	Option	Location	Locator View	Connector End View
A3L	Sunshade - Left	--	In the passenger compartment, left front, mounted to the headliner at left front	--	--
A3R	Sunshade - Right	--	In the passenger compartment, right front, mounted to the headliner at right front	--	--
A4	Hybrid/EV battery pack	HP6	In the luggage compartment, right behind rear of the seats	Right Side of Luggage Compartment Components	--
A7	Fuel Pump and Level Sensor Assembly	--	In the vehicle underbody, below rear seats, mounted to fuel tank	Fuel Tank Components	A7 Fuel Pump and Level Sensor Assembly
A9A	Outside Rearview Mirror - Driver	--	On outside of driver door, front middle, forward of window opening	Driver Door Components	--
A9B	Outside Rearview Mirror - Passenger	--	On outside of passenger door, front middle, forward of window opening	Passenger Door Components	--
A10	Inside Rearview Mirror	DD8	In the passenger compartment, front center, mounted to top of windshield	Headliner Components	A10 Inside Rearview Mirror (DD8)
A11	Radio	--	In the passenger compartment, front right in instrument panel, near instrument panel courtesy lamp - right	Rear of Instrument Panel Components	• A11 Radio X1 • A11 Radio X2 • A11 Radio X3 • A11 Radio X5 (U2K or U2M) • A11 Radio X7 (IO5) • A11 Radio X8 (IO2)
A14D	Seat Lumbar Support Pump - Driver	--	In the passenger compartment, left forward of center, in driver seat back outboard side	Driver Seat Components	A14D Seat Lumbar Support Pump - Driver
A14P	Seat Lumbar Support Pump - Passenger	APH	In the passenger compartment, right forward of center, in the passenger seat back outboard side	Passenger Seat Components	A14P Seat Lumbar Support Pump - Passenger (APH)
A15	Starter/Generator	HP6	In the engine compartment, right front of engine	--	• A15 Starter/Generator X1 (HP6) • A15 Starter/Generator X2 (HP6)
A22	Radio Controls	--	In the passenger compartment, center front, part of the info display module, in instrument panel, above HVAC controls	Front of Instrument Panel Components	--
A23D	Door Latch Assembly - Driver	--	Inside the driver door, at rear below middle	Driver Door Components	A23D Door Latch Assembly - Driver
A23LR	Door Latch Assembly - Left Rear	--	Inside the left rear door, at rear below middle	Left Rear Door Components	A23LR Door Latch Assembly - Left Rear
A23P	Door Latch Assembly - Passenger	--	Inside the passenger door, at rear below middle	Passenger Door Components	A23P Door Latch Assembly - Passenger
A23RR	Door Latch Assembly - Right Rear	--	Inside the right rear door, at rear below middle	Right Rear Door Components	A23RR Door Latch Assembly - Right Rear
A24D	Door Handle Assembly - Driver Exterior	ATH	On the outside of driver door, rear middle	Driver Door Components	A24D Door Handle Assembly - Driver Exterior (ATH)
A24LR	Door Handle Assembly - Left Rear Exterior	ATH	On the outside of left rear door, rear middle	Left Rear Door Components	A24LR Door Handle Assembly - Left Rear Exterior (ATH)
A24P	Door Handle Assembly - Passenger Exterior	ATH	On the outside of passenger door, rear middle	Passenger Door Components	A24P Door Handle Assembly - Passenger Exterior (ATH)
A24RR	Door Handle Assembly - Right Rear Exterior	ATH	On the outside of right rear door, rear middle	Right Rear Door Components	A24RR Door Handle Assembly - Right Rear Exterior (ATH)
A26	HVAC Controls	--	In the passenger compartment, front center, on instrument panel, below radio controls	Front of Instrument Panel Components	A26 HVAC Controls
A33	Media Disc Player	--	In the passenger compartment, front center, on instrument panel, below and forward of radio controls	--	A33 Media Disc Player
B1	A/C Refrigerant Pressure Sensor	--	At the front of vehicle, right of center, front of A/C condenser, mounted to right side near bottom	Radiator Assembly Components	• B1 A/C Refrigerant Pressure Sensor (LFX or LWJ) • B1 A/C Refrigerant Pressure Sensor (LWW)
B5LF	Wheel Speed Sensor - Left Front	--	At the left front suspension, mounted to knuckle, rearward of axle	Fuel Composition Sensor, Wheel Speed Sensors and Parking Brake	B5LF Wheel Speed Sensor - Left Front
B5LR	Wheel Speed Sensor - Left Rear	--	At the left rear suspension, mounted to knuckle, forward side	Fuel Composition Sensor, Wheel Speed Sensors and Parking Brake	B5LR Wheel Speed Sensor - Left Rear
B5RF	Wheel Speed Sensor - Right Front	--	At the right front suspension, mounted to knuckle, rearward of axle	Fuel Composition Sensor, Wheel Speed Sensors and Parking Brake	B5RF Wheel Speed Sensor - Right Front
B5RR	Wheel Speed Sensor - Right Rear	--	At the right rear suspension, mounted to knuckle, forward side	Fuel Composition Sensor, Wheel Speed Sensors and Parking Brake	B5RR Wheel Speed Sensor - Right Rear
B7D	Air Temperature Sensor - Duct Left Lower	C32	In the passenger compartment, within the instrument panel, center front, left side middle of HVAC assembly	HVAC Assembly Components (C32)	B7D Air Temperature Sensor - Duct Left Lower (C32)
B7E	Air Temperature Sensor - Duct Right Lower	C32	In the passenger compartment, within the instrument panel, center front, right side middle of HVAC assembly	HVAC Assembly Components (C32)	B7E Air Temperature Sensor - Duct Right Lower (C32)
B7H	Air Temperature Sensor - Duct Left Upper	C32	In the passenger compartment, within the instrument panel, center front, left side top of HVAC assembly	HVAC Assembly Components (C32)	B7H Air Temperature Sensor - Duct Left Upper (C32)
B7J	Air Temperature Sensor - Duct Right Upper	C32	In the passenger compartment, within the instrument panel, center front, right side top of HVAC assembly	HVAC Assembly Components (C32)	B7J Air Temperature Sensor - Duct Right Upper (C32)
B9	Ambient Air Temperature Sensor	--	At the front of vehicle, left of center, mounted to rear of lower grille	Front of Vehicle Components	B9 Ambient Air Temperature Sensor
B10B	Ambient Light/Sunload Sensor	--	In the passenger compartment, center front, in instrument panel, rear of windshield defroster outlet	Front of Instrument Panel Components	B10B Ambient Light/Sunload Sensor
B12A	Transmission Fluid Pressure Switch	--	In the engine compartment, part of the control solenoid valve assembly, mounted to the valve body inside the transmission	--	--
B13	Transmission Fluid Temperature Sensor	--	In the engine compartment, part of the control solenoid valve assembly, mounted to the valve body inside the transmission	--	--

3820020

1. **Mouse-over:** None at this time.
2. **Hotspot Link to Information:**
   - ⇒ A future update may include links to individual subsystem schematic(s) for each component/ harness item.

⇒ **Components**
- – Links to individual locator view within one of the eight component view categories and will show where the component is located in the vehicle.
- – Links to individual connector end view(s) within Component Connector End Views.

⇒ **Electrical Centers (Fuse Blocks)**
- – Links to individual locator view within one of the eight component view categories and will show where the component is located in the vehicle.
- – Links to individual connector end view(s) within Electrical Center Identification Views.

⇒ **Inline Harness Connectors**
- – Links to individual harness routing view(s) within Harness Routing Views and will show where the harness item is located on the vehicle harness.
- – Links to individual connector end view(s) within Inline Harness Connector End Views.

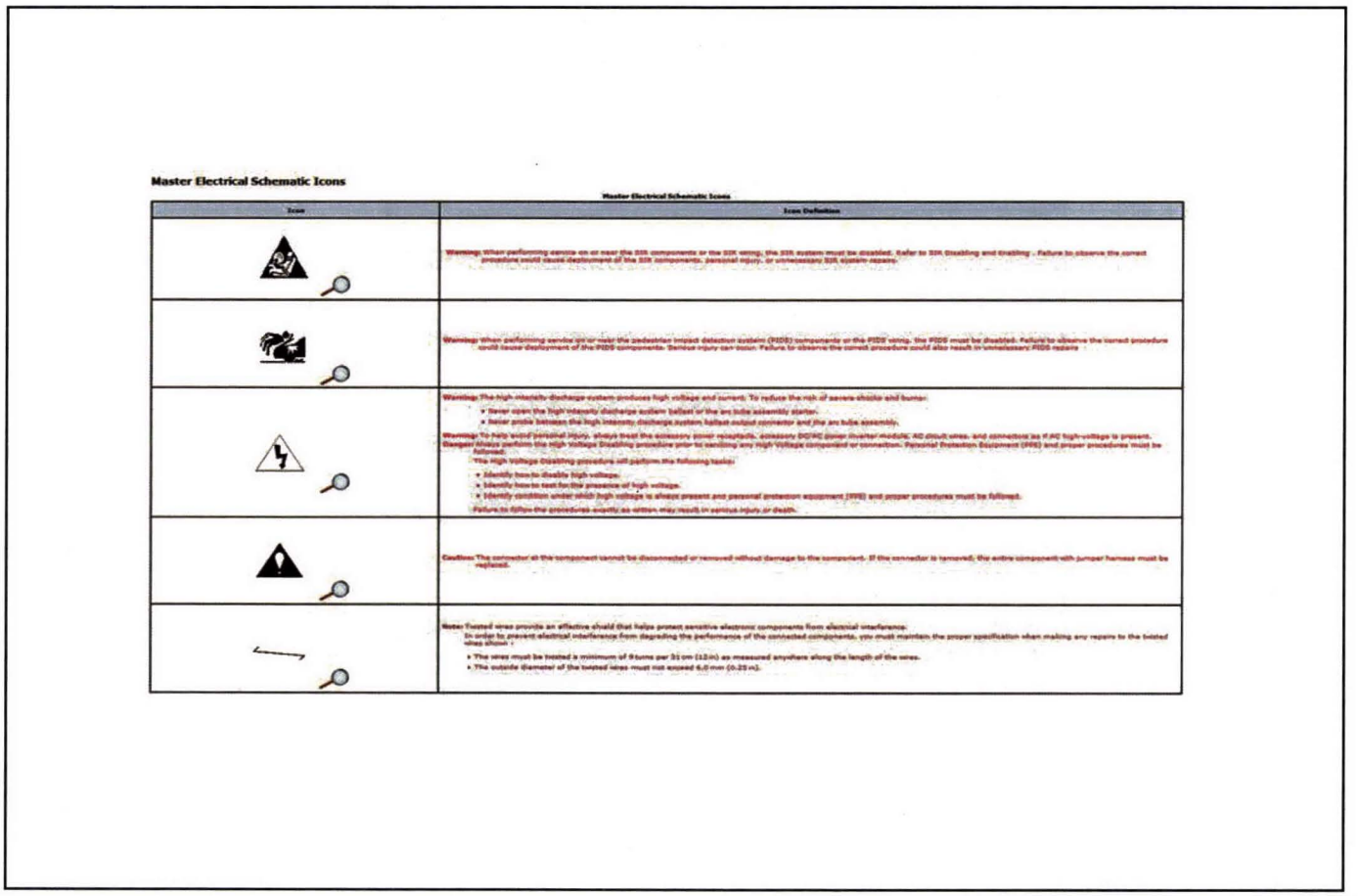
⇒ **Grounds**
- – Links to individual locator view within Ground Views component view and will show where the ground is located in the vehicle.

⇒ **Splices**
- – Links to individual harness routing view(s) within Harness Routing Views and will show where the harness item is located on the vehicle harness.

⇒ **Splice Packs**
- – Links to individual harness routing view(s) within Harness Routing Views and will show where the harness item is located on the vehicle harness.
- – Links to individual connector end view(s) within Splice Pack Connector End Views.

Master Electrical Schematic Icons

While the master electrical schematic icons list format has not changed, it will continue to include icons used in the vehicle schematics along with the message for the icon.



3820510

1. **Mouse-over:** None at this time.
2. **Hotspot Link to Information:** None at this time.

Schematic RPO Code List

The schematic RPO code list only includes RPOs shown in schematics and also includes the country groupings for the options. This list is in addition to the vehicle RPO Code List that is included in General Information.

Schematics RPO Code List

Schematics RPO Code List

RPO	Description	Country Group
A4S	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION	U.S.A., PR and USVI (MAH)
A6C	ADJUSTER PASS ST-MANUAL, 4 WAY, PWR VERT	U.S.A., PR and USVI (MAH),Canada (MBC)
A6D	WINDOW ASS PASS DR-POWER OPERATED, EXPRESS DOWN	China
A6F	WINDOW ASS PASS DR-POWER OPERATED, EXPRESS UP/DOWN	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX), China
A6Q	WINDOW-POWER OPERATED, RR DRS, EXPRESS DOWN	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
A6R	WINDOW-POWER OPERATED, RR DRS, EXPRESS UP/DOWN	China
AP6	CONTROL-SEAT, MASSAGE, DRIVER	China
AQ1	ADJUSTER FRT ST-POWER, MULTI-DIRECTIONAL, DRIVER	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
AQ2	ADJUSTER PASS ST-POWER, MULTI-DIRECTIONAL	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
APQ	CONTROL-SEAT, POWER LUMBAR, LH	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
APH	CONTROL-SEAT, POWER LUMBAR, RH	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
AQV	EQUIPMENT-SENSOR AIR MOISTURE and W/S TEMP	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
ATS	Lock Control, Entry – Remote Entry, Standard Range, Passive Entry	China
AW7	RESTRAINT SYSTEM-SEAT, INFLATABLE, DRIVER AND PASS FRT, FRT SEAT SIDE AND RR SEAT SIDE, ROOF SIDE	U.S.A., PR and USVI (MAH),Canada (MBC)
BTM	SWITCH-ENGINE START, KEYLESS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
C67	HVAC SYSTEM-AIR CONDITIONER FRT, ELECTRONIC CONTROLS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
CE1	WIPER SYSTEM-WINDSHIELD, PULSE, MOISTURE SENSITIVE	China
CJ4	WASHER-HEADLAMP, HIGH PRESSURE	China
CP5	ROOF-SUN, GLASS, SLIDING, ELEC	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
C32	HVAC SYSTEM-AIR CONDITIONER FRT, AUTO TEMP CONT, AUX TEMP CONT	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
C22	COUNTRY-CHINA	China
DD8	MIRROR L/S R/V-LT SENSITIVE	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
EF7	COUNTRY-UNITED STATES OF AMERICA (USA)	U.S.A., PR and USVI (MAH)
F4S	CHASSIS-CONTINUOUSLY VARIABLE REAL TIME DAMPING	U.S.A., PR and USVI (MAH),Canada (MBC)
FH5	VEHICLE FUEL-GASOLINE E85	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
HP6	HYBRID PROPULSION-ELECTRIC, PARALLEL, 14KW CONTINUOUS POWER	U.S.A., PR and USVI (MAH),Canada (MBC)
JF1	BRAKE PARKING-POWER OPERATED	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
KA1	HEATER SEAT FRT-DRVR and PASS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
KD4	RECEPTACLE-ELECTRICAL, FRT CONSOLE	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
KI6	RECEPTACLE-ELECTRICAL, FRT CONSOLE RR 110 VOLT	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
KRJ	CONTROL-CONSOLE, INFOTAINMENT, REDUNDANT CONTROLS, JOYSTICK	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
KTA	AUDIO INTERFACE*	China
KU1	VENTILATED SEAT DRVR-FRONT	U.S.A., PR and USVI (MAH)
KU3	VENTILATED SEAT PASS-FRONT	U.S.A., PR and USVI (MAH)
LAF	ENGINE-GAS, 4 CYL, 2.4L, SIDI,DOHC, VVT, ALUM, GM - DO NOT USE AFTER 2013. USE LEA	China
LDK	ENGINE-GAS, 4 CYL, 2.0L, DI, DOHC, TURBO-HO, VARIABLE CAMSHAFT PHASING - DO NOT USE AFTER 2013. USE LHU	China
LHU	ENGINE-GAS, 2.0L, SIDI, L4, DOHC TURBO, E85 MAX, ALUM	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
LLU	ENGINE-GAS, 4 CYL, 1.6L, MFI, DOHC, TURBO, FT-IV, 132KW	China
L7D	ENGINE-GAS, 4 CYL, 2.0L, MFI, ALUM, DOHC, SGM	China
LUK	ENGINE-GAS, 4 CYL, 2.4L, DI, ALUM, DOHC, BAS, ECOTEC	U.S.A., PR and USVI (MAH),Canada (MBC)
MD6	TRANSMISSION-AUTO 6 SPD, AISIN-WARNER, A6-AF40, ELECTRONIC, GEN2	U.S.A., PR and USVI (MAH),Canada (MBC)
MH9	TRANSMISSION-AUTO 6 SPD, HMD, M23F	U.S.A., PR and USVI (MAH),Canada (MBC)
MH4	TRANSMISSION-AUTO 6 SPD, HMD, GM, BAS+, 6T40, HYBRID, FWD	U.S.A., PR and USVI (MAH),Canada (MBC)
MH6	TRANSMISSION-AUTO 6 SPD, 6T30	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
MK6	TRANSMISSION-MAN 6 SPD, OPEL, 82MM, 3.92 1ST, 0.62 6TH (F40 WK), REDUCE HELEX	U.S.A., PR and USVI (MAH),Canada (MBC)
N21	STEERING-POWER, NON-VARIABLE RATIO, ELECTRIC	U.S.A., PR and USVI (MAH),Canada (MBC)
NU6	EMISSION SYSTEM-CALIFORNIA, PZEV	U.S.A., PR and USVI (MAH)
NV7	STEERING-POWER, VARIABLE EFFORT	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
NYC	STEERING-POWER, VARIABLE EFFORT, REDUCED RACK TRAVEL	U.S.A., PR and USVI (MAH),Canada (MBC)
T4A	HEADLAMPS-HALOGEN	U.S.A., PR and USVI (MAH),Canada (MBC)

3820023

1. **Mouse-over:** None at this time.
2. **Hotspot Link to Information:** None at this time.

Electrical Schematic Symbols

Voltage Indicators

Symbol	Description
B+ 1988677	Battery Voltage

Voltage Indicators (cont'd)

Symbol	Description
IGN 0 1988679	Ignition Switch– Off Position

Voltage Indicators (cont'd)

Symbol	Description
 1988682	Ignition Switch– Accessory Position
 1988686	Ignition Switch– Run Position
 1988691	Ignition Switch– Start Position

General Icons

Symbol	Description
 1990537	Master Component List Icon This icon is used on the schematic to link to the Master Electrical Component List.
 1990538	Description and Operation Icon This icon is used on the schematic to link to the Description and Operation of that particular system.

General Icons (cont'd)

Symbol	Description
 1988674	Computer Programming Icon This icon is used on the schematic to link to Control Module References, which identifies which components need programming upon replacement.
 1990541	Next Schematic Page Icon This icon is used on the schematic to navigate to the next schematic in the subsystem.
 1990542	Previous Schematic Page Icon This icon is used on the schematic to navigate to the previous schematic in the subsystem.
 1988667	Supplemental Inflatable Restraint (SIR) or Supplemental Restraint System (SRS) Icon This icon is used to alert the technician that the system contains SIR/SRS components that require certain precautions before servicing.
 1988670	Information Icon This icon is used to alert the technician that there is additional information that will aid in servicing a system.

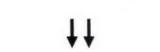
General Icons (cont'd)

Symbol	Description
 1988672	Danger Icon This icon is intended to alert the technician that a component within the system contains labeling with the same icon. This icon is used when a source component has potential for 60 volts DC or greater or has potential for 42 volts AC or greater.
 1988673	High Voltage Icon This icon is intended to alert the technician that a component within the system contains labeling with the same icon. This icon is used when a component/circuit has potential for 60 volts DC or greater or has potential for 42 volts AC or greater.
 1990543	Caution Icon This icon is used to advise the technician to use caution when servicing this component. This icon may be used when a component/circuit has a voltage range potential between 30-60 volts DC or 15-42 volts AC.
 1988675	Functional Serial Data Communication This icon is used to show the technician that the serial data circuit detail is shown incomplete. It also provides an active link to the Data Communication Schematics were the circuit is shown complete.

Switch Position Icons

Symbol	Description
 1989016	Generic Up Arrows

Switch Position Icons (cont'd)

Symbol	Description
 1990554	Generic Down Arrows
 1990555	Generic Left Arrows
 1990556	Generic Right Arrows
 1990557	Generic Express Down Arrows
 1990558	On/Off Icon

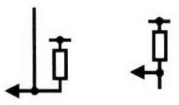
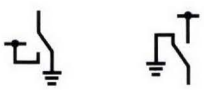
Switch Position Icons (cont'd)

Symbol	Description
 1990559	Generic Lock Icon
 1990560	Generic Unlock Icon
 1989018	Generic Window Switch Positions– 4 Door
 1989020	Generic Window Switch Positions– 2 Door

Module Circuit Function Icons

Symbol	Description
 1988774	I/O Pull-Down Resistors (−)

Module Circuit Function Icons (cont'd)

Symbol	Description
 1990567	I/O Pull-Up Resistors (+)
 1988775	I/O High-Side Drive Switch (+)
 1990568	I/O Low-Side Drive Switch (+)
 1990570	I/O Bidirectional Switch (+/−)
1990571	Pulse-Width Modulation Symbol

Module Circuit Function Icons (cont'd)

Symbol	Description
B+ 1990573	Battery Voltage
IGN 1990574	Ignition Voltage
5V 1990576	Voltage Reference
5V AC 1990577	A/C Voltage
1988986	Low Reference

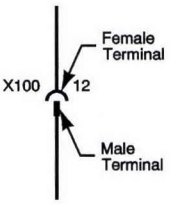
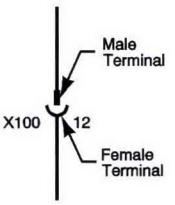
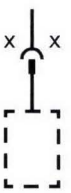
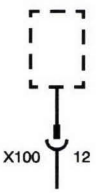
Module Circuit Function Icons (cont'd)

Symbol	Description
1990578	Ground
1990579	Serial Data
1988973	Antenna Signal– In
1988974	Antenna Signal– Out
2161152	Brake Apply

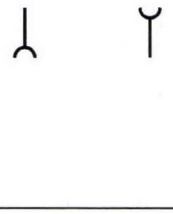
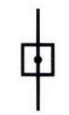
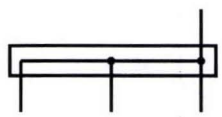
Harness Components

Symbol	Description
 1988731	Fuse
 1988733	Fuse Supplied by a Relay
 1988740	Circuit Breaker
 1988745	Fusible Link
 1988987	Ground

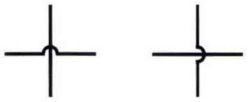
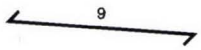
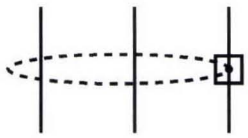
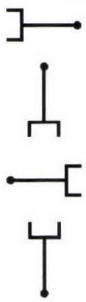
Harness Components (cont'd)

Symbol	Description
 1988746	Case Ground
 1988977	Inline Harness Connector
 1990974	Inline Harness Connector
 1990975	Pigtail Connection
 1990976	Pigtail Connection

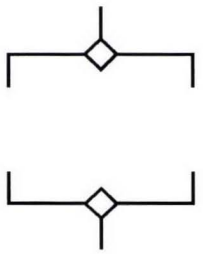
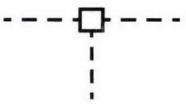
Harness Components (cont'd)

Symbol	Description
 1990977	Provisional or Diagnostic Connector
 1990978	Blunt Cut Wire
 1988980	Incomplete Physical Splice
 1988981	Complete Physical Splice– 2 Wires
 1988982	Complete Physical Splice– 3 or more wires

Harness Components (cont'd)

Symbol	Description
 1990979	Wire Crosses
 1988988	Twisted Wires
 1988990	Shield
 1990980	Circuit References
 1990981	Circuit Continuation Arrowheads

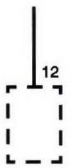
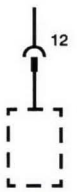
Harness Components (cont'd)

Symbol	Description
 1988983	Option Breakpoint
 1988984	Ground Circuit Connection
 1988985	Connector Shorting Clip

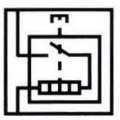
Component Parts

Symbol	Description
 1988694	Partial Component When a component is represented in a dashed box, the component or its wiring is not shown in its entirety.
 1988698	Entire Component When a component is represented in a solid box the component or its wiring is shown in its entirety.

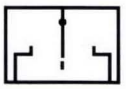
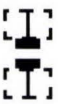
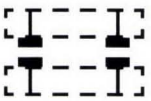
Component Parts (cont'd)

Symbol	Description
 1988712	Connector Directly Attached to Component
 1988715	Pigtail Connector

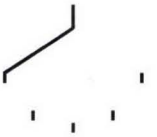
Switches and Relays

Symbol	Description
 1991015	Accessory Power Outlet
 1991016	Cigar Lighter
 1988991	Switch– 2 Position Normally Open

Switches and Relays (cont'd)

Symbol	Description
 1988992	Switch– 2 Position Normally Closed
 1988993	Switch– Rocker
 1991017	Switch– Contact Plate (1 Wire)
 1988994	Switch– Contact Plate (2 Wire)
 1991018	Switch– 3 Position

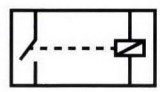
Switches and Relays (cont'd)

Symbol	Description
 1988995	Switch– 4 Position
 1991019	Switch– 5 Position
 1991021	Switch– 6 Position
 1988997	Switch Actuator– Push (Momentary)
 1988998	Switch Actuator– Push (Latching)

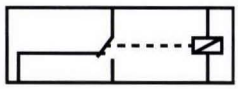
Switches and Relays (cont'd)

Symbol	Description
1988999	Switch Actuator– Pull (Momentary)
1989000	Switch Actuator– Pull (Latching)
1989001	Switch Actuator– Rotate (Momentary)
1989002	Switch Actuator– Rotate (Latching)
1989003	Switch Actuator– Slide (Momentary)

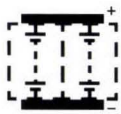
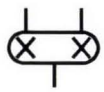
Switches and Relays (cont'd)

Symbol	Description
1989004	Switch Actuator– Slide (Latching)
1989007	Switch Actuator– Pressure (Momentary)
1989010	Switch Actuator– Temperature (Momentary)
1989013	Switch Actuator– Volume (Latching)
 1988975	4-Pin Single Pole/Throw Relay– Normally Open

Switches and Relays (cont'd)

Symbol	Description
 1990539	5-Pin Relay– Normally Closed

Devices and Sensors

Symbol	Description
 1988751	Battery
 1988753	Battery Assembly– Hybrid
 1988717	Single Filament Light Bulb
 1988719	Double Filament Light Bulb

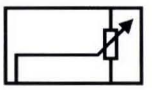
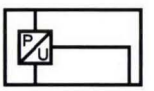
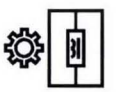
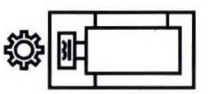
Devices and Sensors (cont'd)

Symbol	Description
 1988722	Light Emitting Diode (LED)
 1988725	Photo Sensor
 1990988	Gauge
 1988776	Diode
 1988748	Capacitor

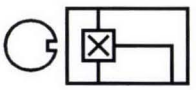
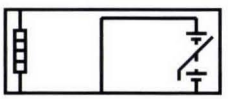
Devices and Sensors (cont'd)

Symbol	Description
 1988755	Resistor
 1988759	Variable Resistor
 1990991	Variable Resistor– NTC
 1990992	Breakable Wire
 1988778	Heating Element

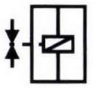
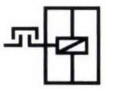
Devices and Sensors (cont'd)

Symbol	Description
 1988771	Position Sensor
 1988773	Pressure Sensor
 1990993	Knock Sensor
 1990994	Inductive Type Sensor– 2-Wire
 1990996	Inductive Type Sensor– 3-Wire

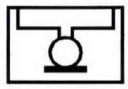
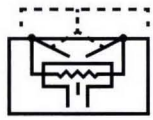
Devices and Sensors (cont'd)

Symbol	Description
 1990998	Hall Effect Sensor– 2-Wire
 1990999	Hall Effect Sensor– 3-Wire
 1991000	Oxygen Sensor– 2-Wire
 1991001	Heated Oxygen Sensor– 4-Wire
 1988970	Solenoid– Actuator

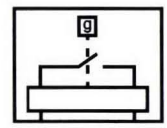
Devices and Sensors (cont'd)

Symbol	Description
 1988971	Solenoid– Valve
 1988972	Clutch
 1988779	Motor
 1991003	Motor with PTC
 1988729	Antenna

Devices and Sensors (cont'd)

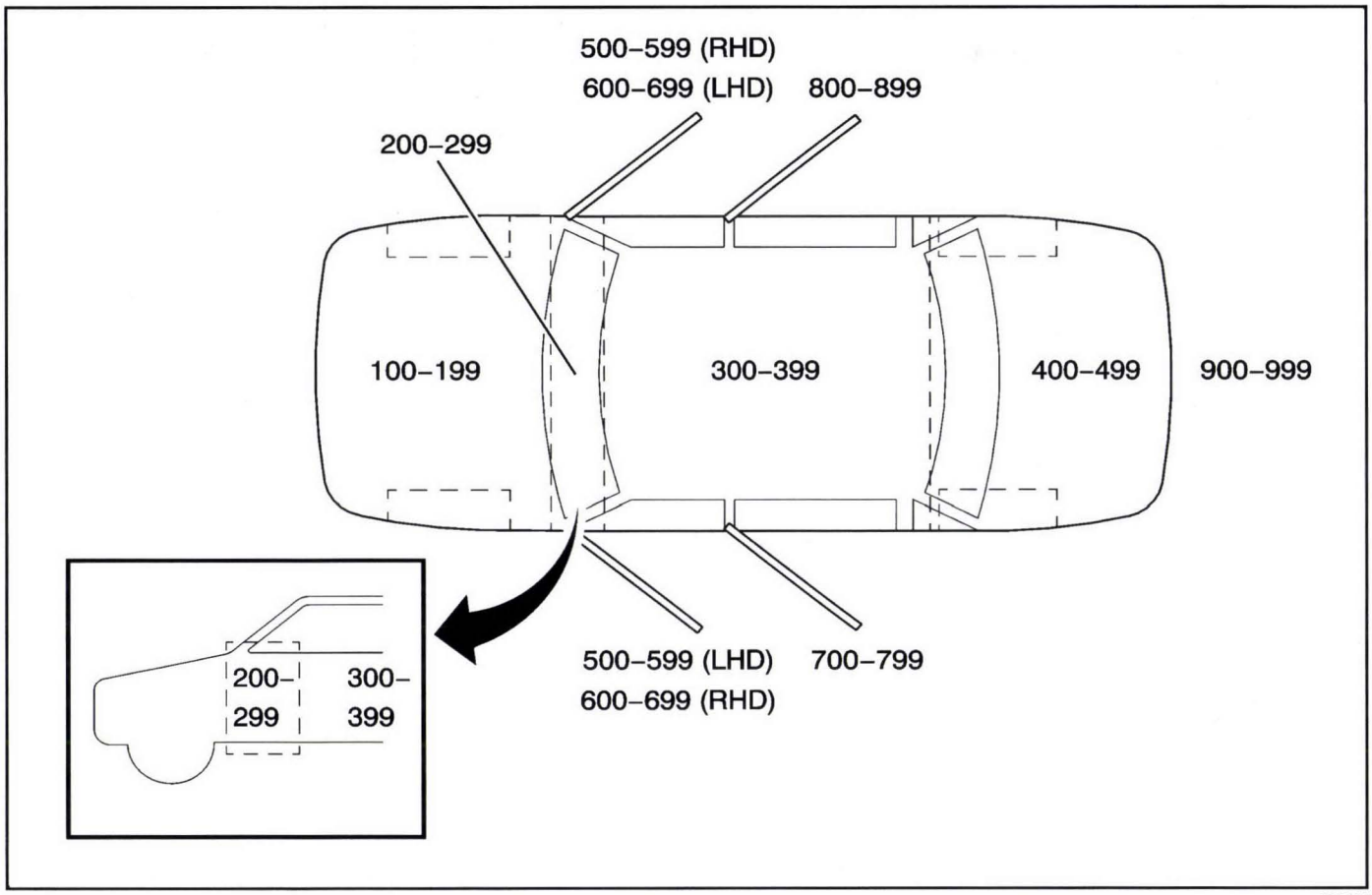
Symbol	Description
 1991005	Speaker
 1991006	Horn
 1991007	Microphone
 1991008	Airbag
 1991009	SIR Coil

Devices and Sensors (cont'd)

Symbol	Description
 1991010	SIR Impact Sensor

Vehicle Zoning Strategy

All grounds, in-line connectors, and splices have identifying numbers that correspond to where they are located in the vehicle. The following table explains the numbering system.



160960

Vehicle Zoning Strategy

Callout Numbers	Zone Description
100-199	Engine compartment (all forward of the instrument panel)
200-299	Within the instrument panel area (between the bulkhead and the front plane of the instrument panel)
300-399	Passenger compartment (from instrument panel to the back of the rear seats)
400-499	Luggage compartment (from the back of the rear seats to the rear of the vehicle)

Vehicle Zoning Strategy (cont'd)

Callout Numbers	Zone Description
500-599	Inline harness connectors to or within the driver door
600-699	Inline harness connectors to or within the front passenger door
700-799	Inline harness connectors to or within the left rear door
800-899	Inline harness connectors to or within the right rear door
900-999	Inline harness connectors to or within the luggage compartment lid or hatch

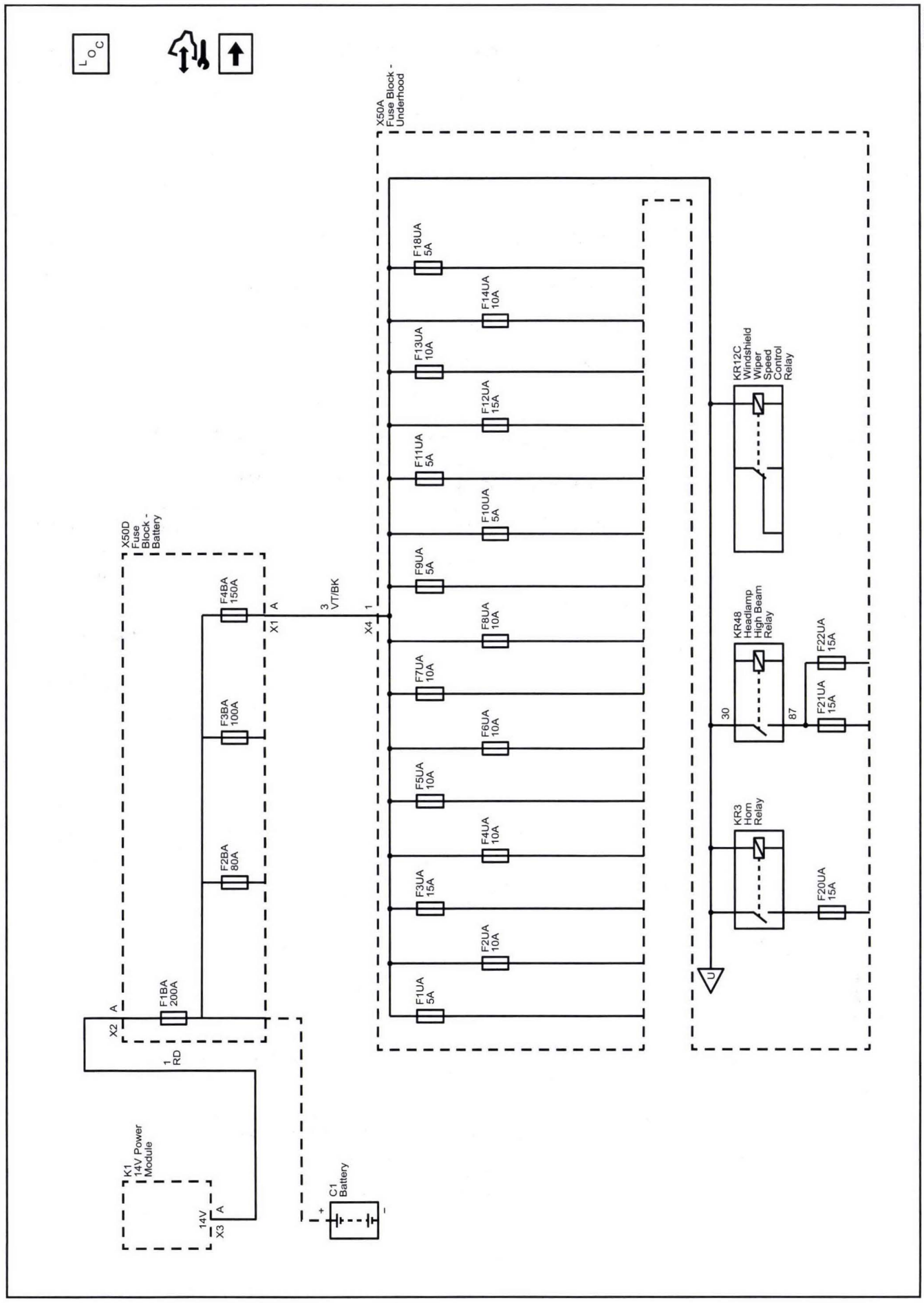
Schematics RPO Code List

RPO	Option Name	Country Group
AW7	RESTRAINT SYSTEM-SEAT, INFLATABLE, DRIVER and PASS FRT, FRT SEAT SIDE and RR SEAT SIDE, ROOF SIDE	Korea (MAW)
AYF	RESTRAINT SYSTEM-SEAT, INFLATABLE, DRIVER and PASS FRT, FRT SEAT SIDEandRR SEAT SIDE, ROOF SIDE, KNEE	U.S.A., PR and USVI (MAH),Canada (MBC)
AYG	SEAT, INFLATABLE, DRIVER & PASS FRT, SEAT SIDE, ROOF SIDE, KNEE	U.S.A., PR and USVI (MAH),Canada (MBC)
BTM	SWITCH-ENGINE START, KEYLESS	U.S.A., PR and USVI (MAH),Canada (MBC), Korea (MAW)
DLW	LH & RH, REMOTE CONTROL, ELECTRIC, MANUAL FOLDING,HEATED	U.S.A., PR and USVI (MAH),Canada (MBC)
LHD	VEHICLE DRIVE-LEFT HAND DRIVE	U.S.A., PR and USVI (MAH),Canada (MBC)
MME	AUTO 4 SPD, AISIN-WARNER, AW 80-40LE, FWD, GEN2	U.S.A., PR and USVI (MAH),Canada (MBC)
T83	CONTROL, HEADLAMPS-AUTOMATIC ON-OFF	U.S.A., PR and USVI (MAH),Canada (MBC), Korea (MAW)
U25	LAMP-INTR, RR COMPT, COURTESY	U.S.A., PR and USVI (MAH),Canada (MBC), Korea (MAW)
UE1	COMMUNICATION SYSTEM-VEHICLE, ONSTAR	U.S.A., PR and USVI (MAH),Canada (MBC)
UF7	RADIO-AM/FM STEREO, SEEK/SCAN, ETR, CLOCK DSP, MP3/WMA, USB, AUX/IN, WIRELESS INTERFACE	U.S.A., PR and USVI (MAH),Canada (MBC), Korea (MAW)
UH7	AM/FM STEREO, SEEK/SCAN, CD, ETR, CLOCK DSP, MP3/WMA, USB, AUX/IN, WIRELESS INTERFACE	U.S.A., PR and USVI (MAH),Canada (MBC), Korea (MAW)
UTJ	THEFT DETERENT-ELECTRICAL, UNAUTHORIZED ENTRY	U.S.A., PR and USVI (MAH),Canada (MBC), Korea (MAW)

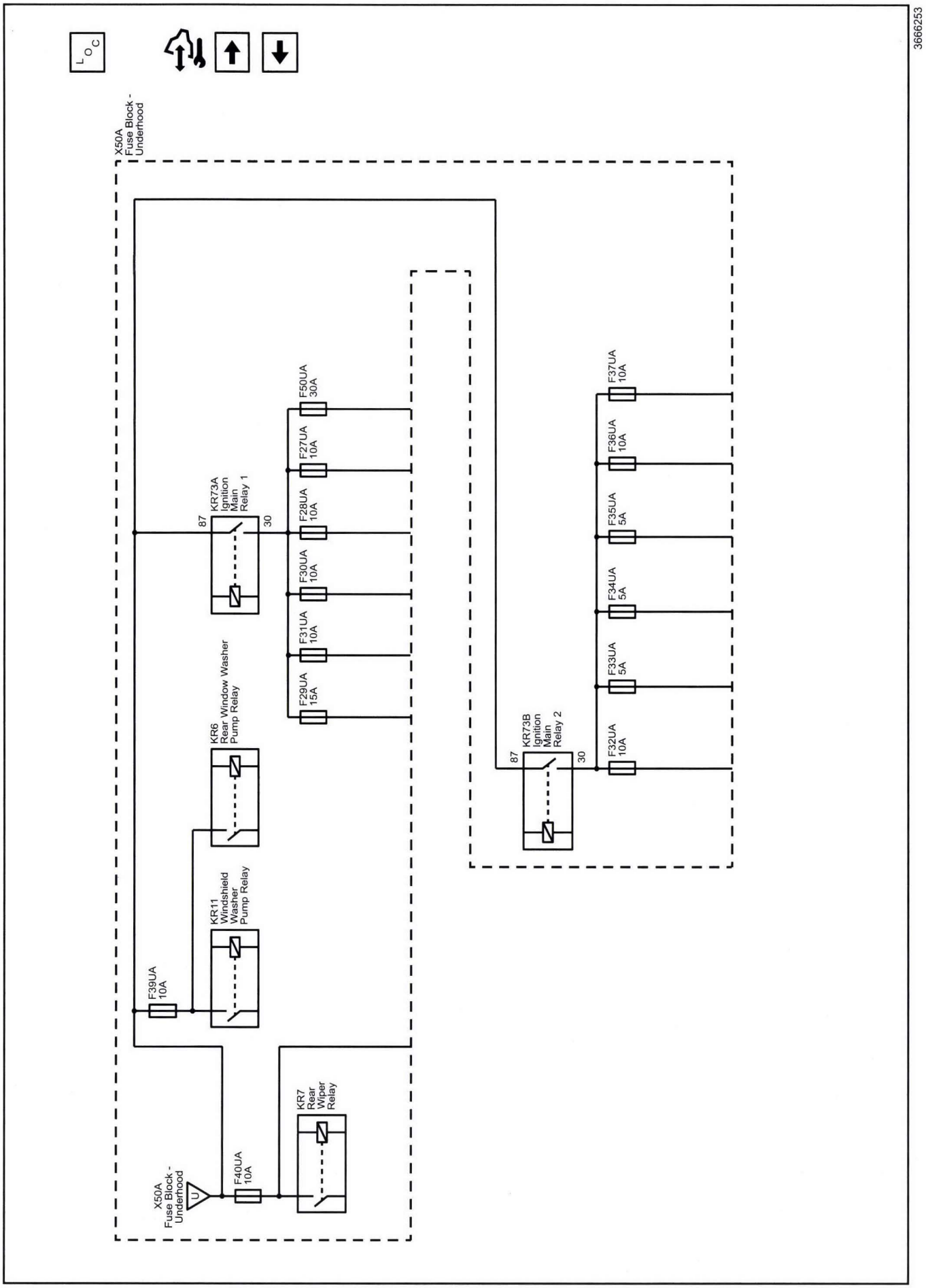
Master Electrical Schematic Icons

Icon	Icon Definition
 19386	***Warning: When performing service on or near the SIR components or the SIR wiring, the SIR system must be disabled. Refer to SIR Disabling and Enabling . Failure to observe the correct procedure could cause deployment of the SIR components, personal injury, or unnecessary SIR system repairs.***
 902886	**Note:** Twisted wires provide an effective shield that helps protect sensitive electronic components from electrical interference. In order to prevent electrical interference from degrading the performance of the connected components, you must maintain the proper specification when making any repairs to the twisted wires shown : • The wires must be twisted a minimum of 10 turns per 31 cm (12 in) as measured anywhere along the length of the wires. • The outside diameter of the twisted wires must not exceed 6.0 mm (0.25 in).

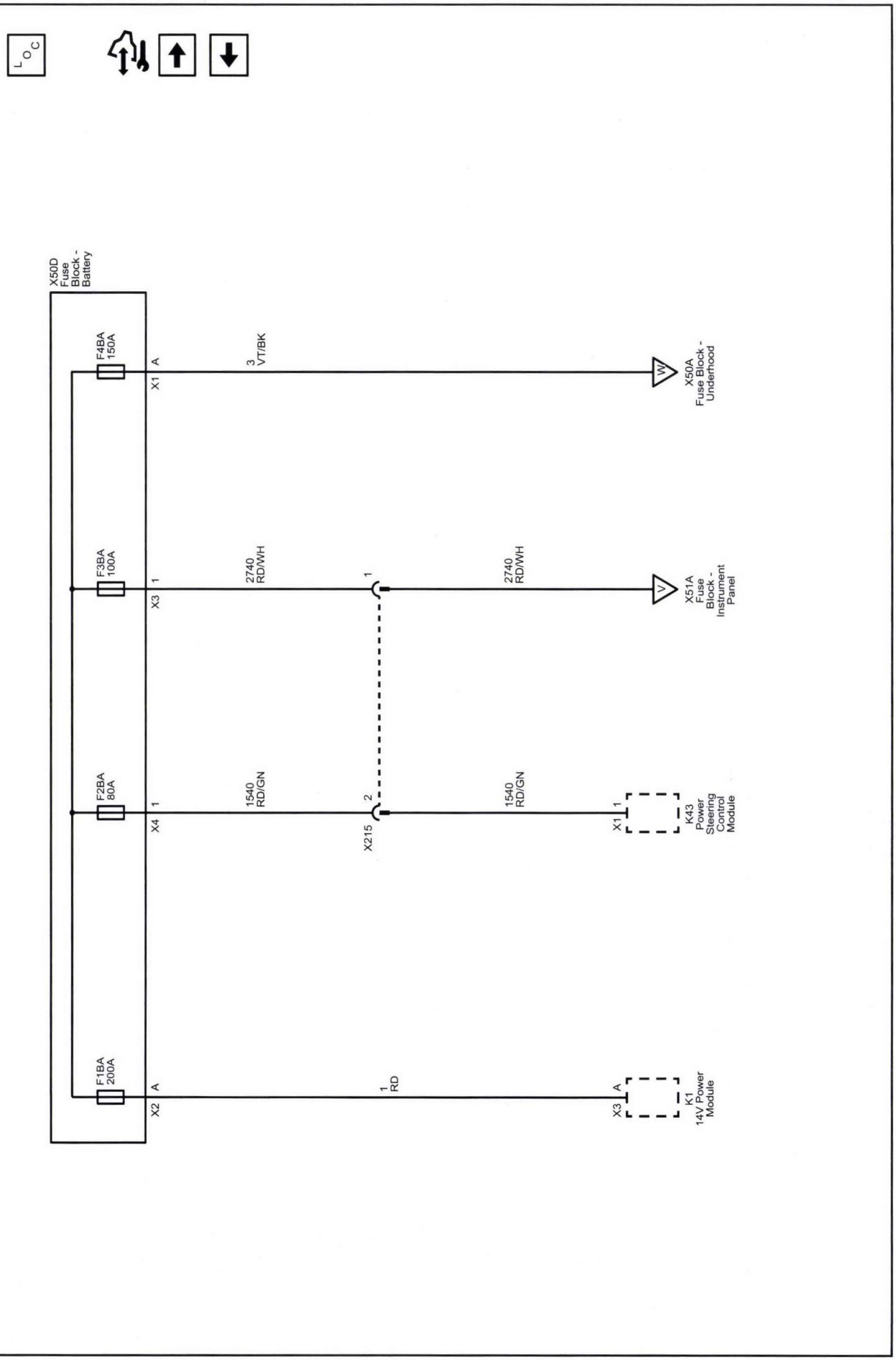
Power Distribution Schematics (B+ Bus (1 of 2))



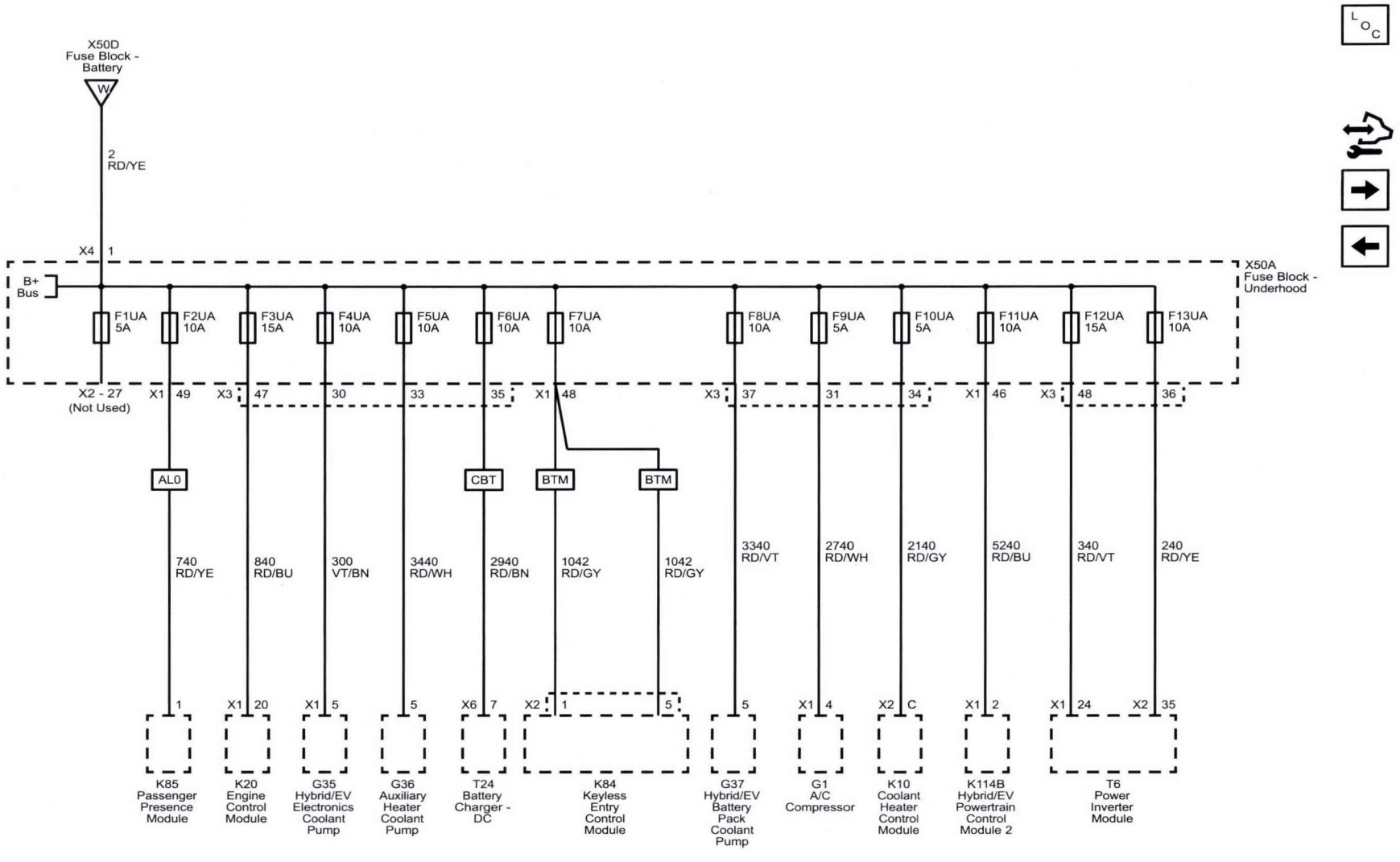
Power Distribution Schematics (B+ Bus (2 of 2))



Power Distribution Schematics (F1BA, F2BA, F3BA, and F4BA Fuses)

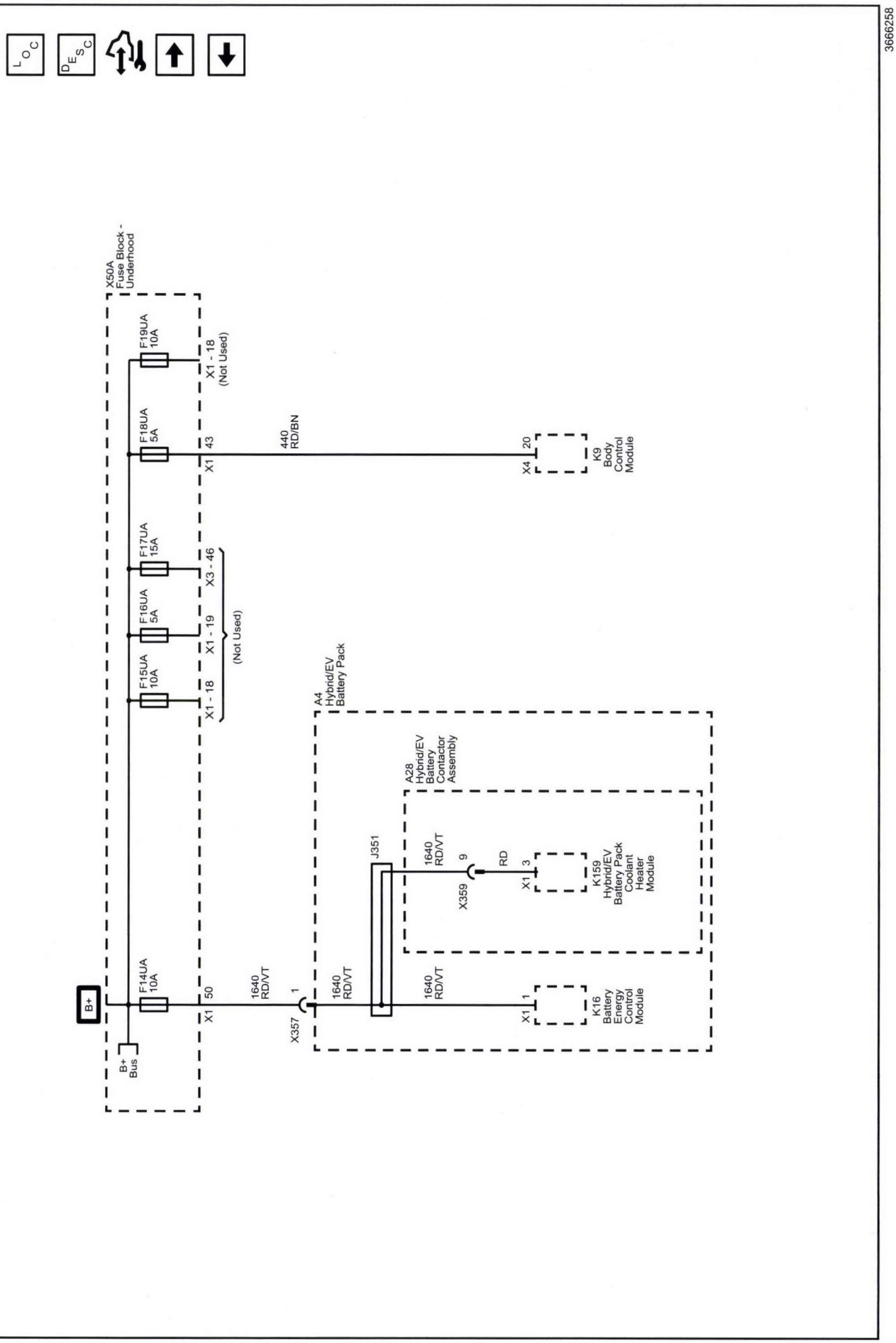


Power Distribution Schematics (F1UA, F2UA, F3UA, F4UA, F5UA, F6UA, F7UA, F8UA, F9UA, FU10UA, FU11UA, F12UA, and F13UA Fuses)

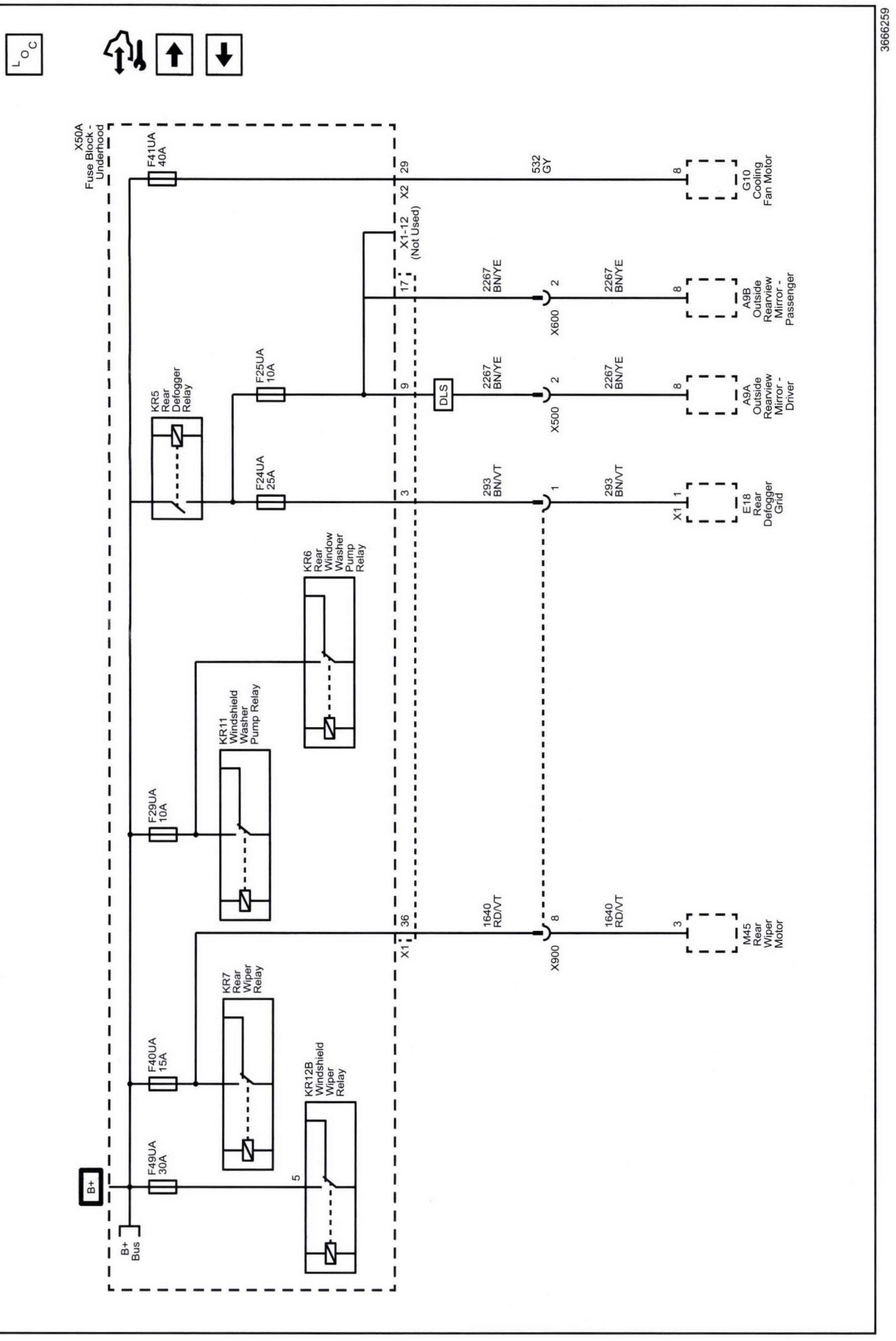


3666256

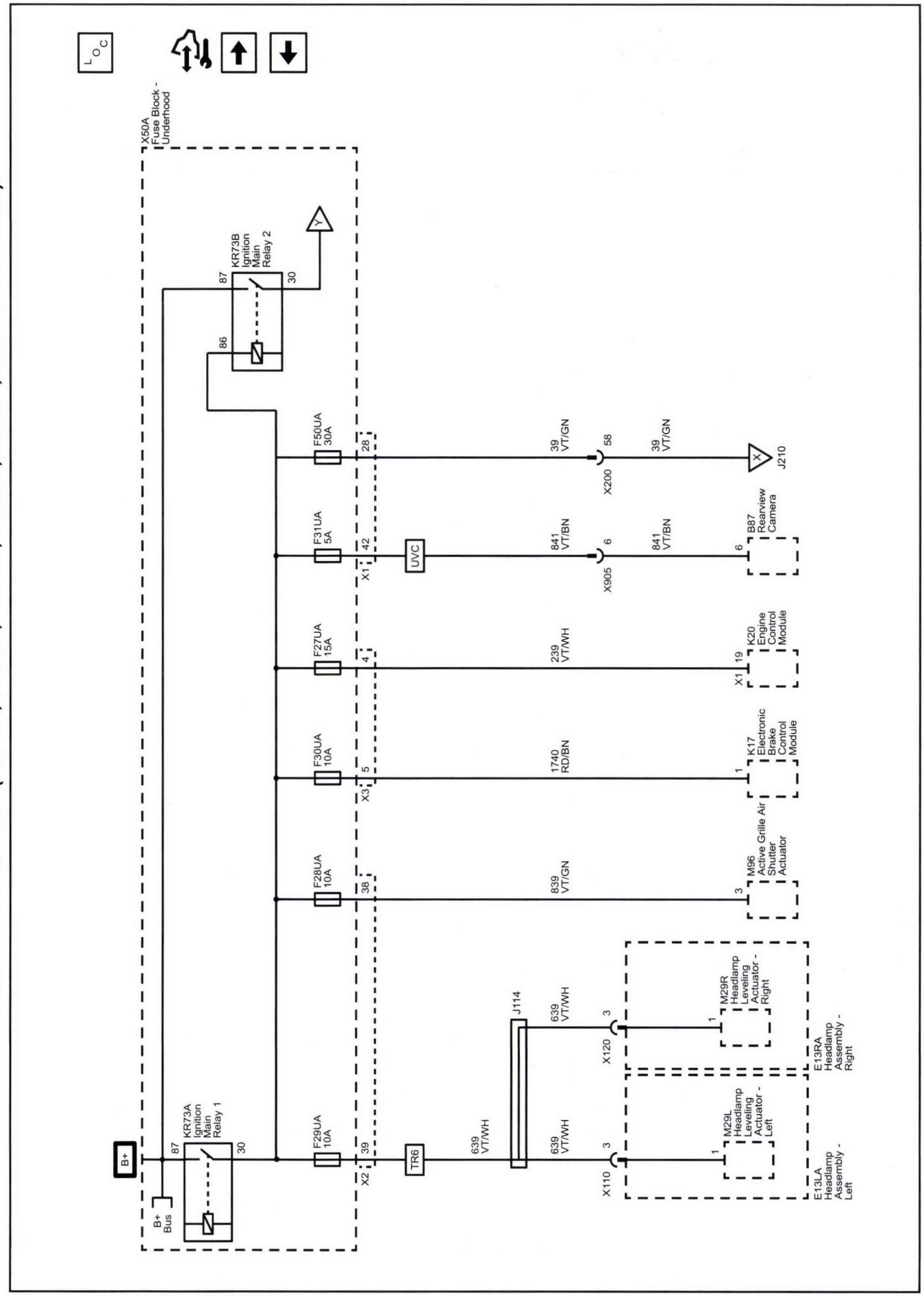
Power Distribution Schematics (F14UA, F15UA, F16UA, F17UA, F18UA and F19UA)



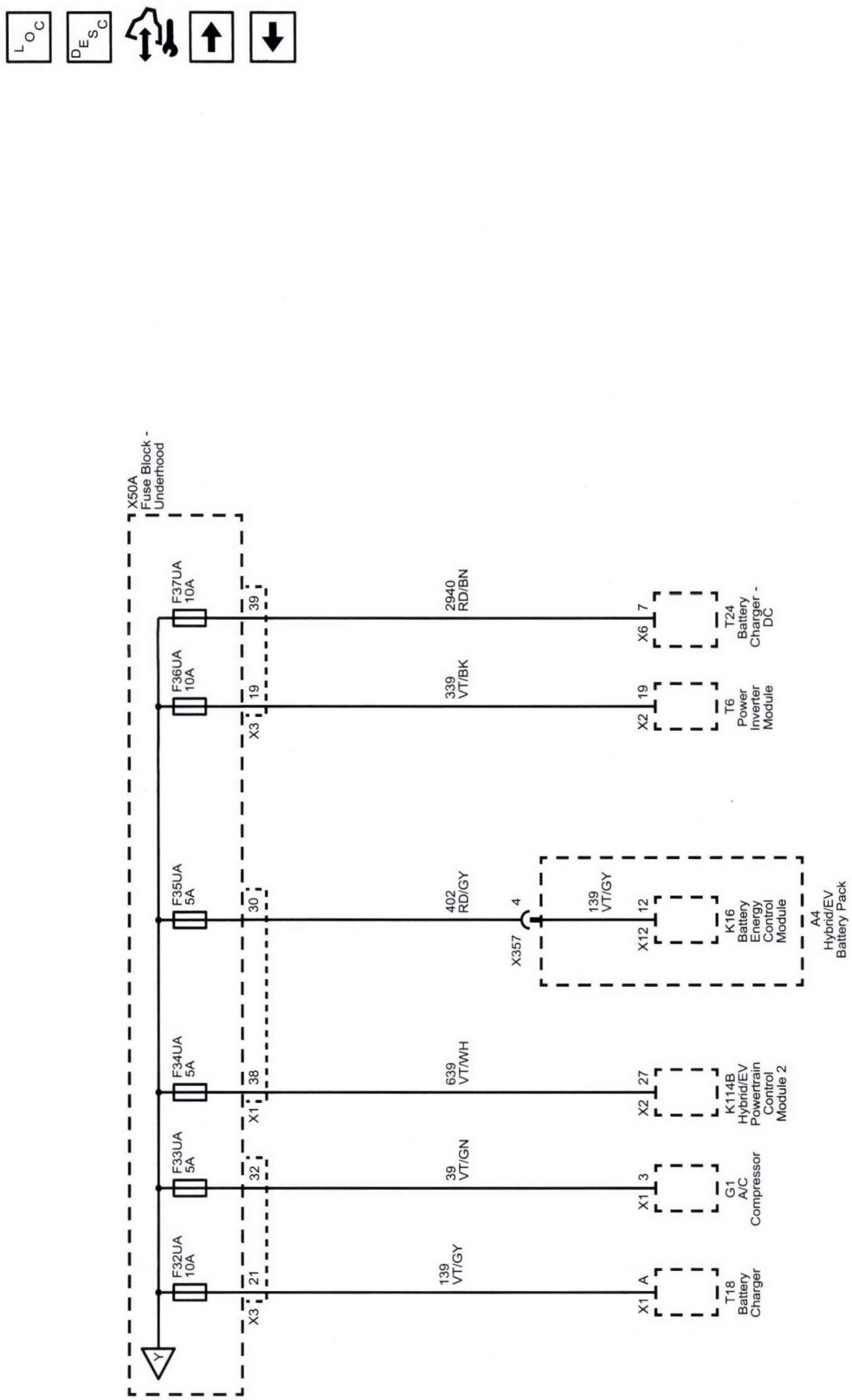
Power Distribution Schematics (F24UA, F25UA, F39UA, F40UA, and F49UA Fuses)



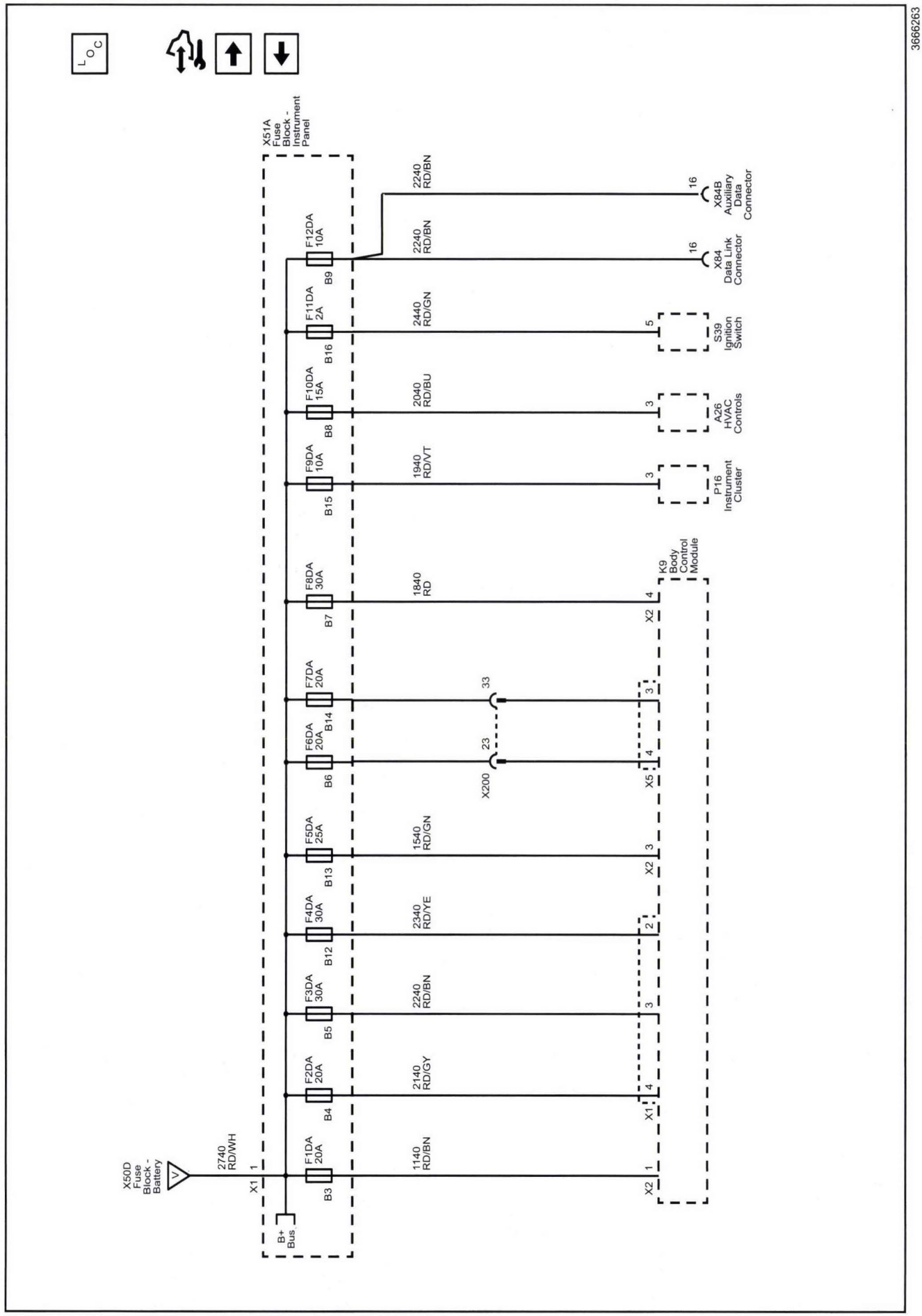
Power Distribution Schematics (F27UA, FU28A, F29UA, F30UA, F31UA, and F50UA Fuses)



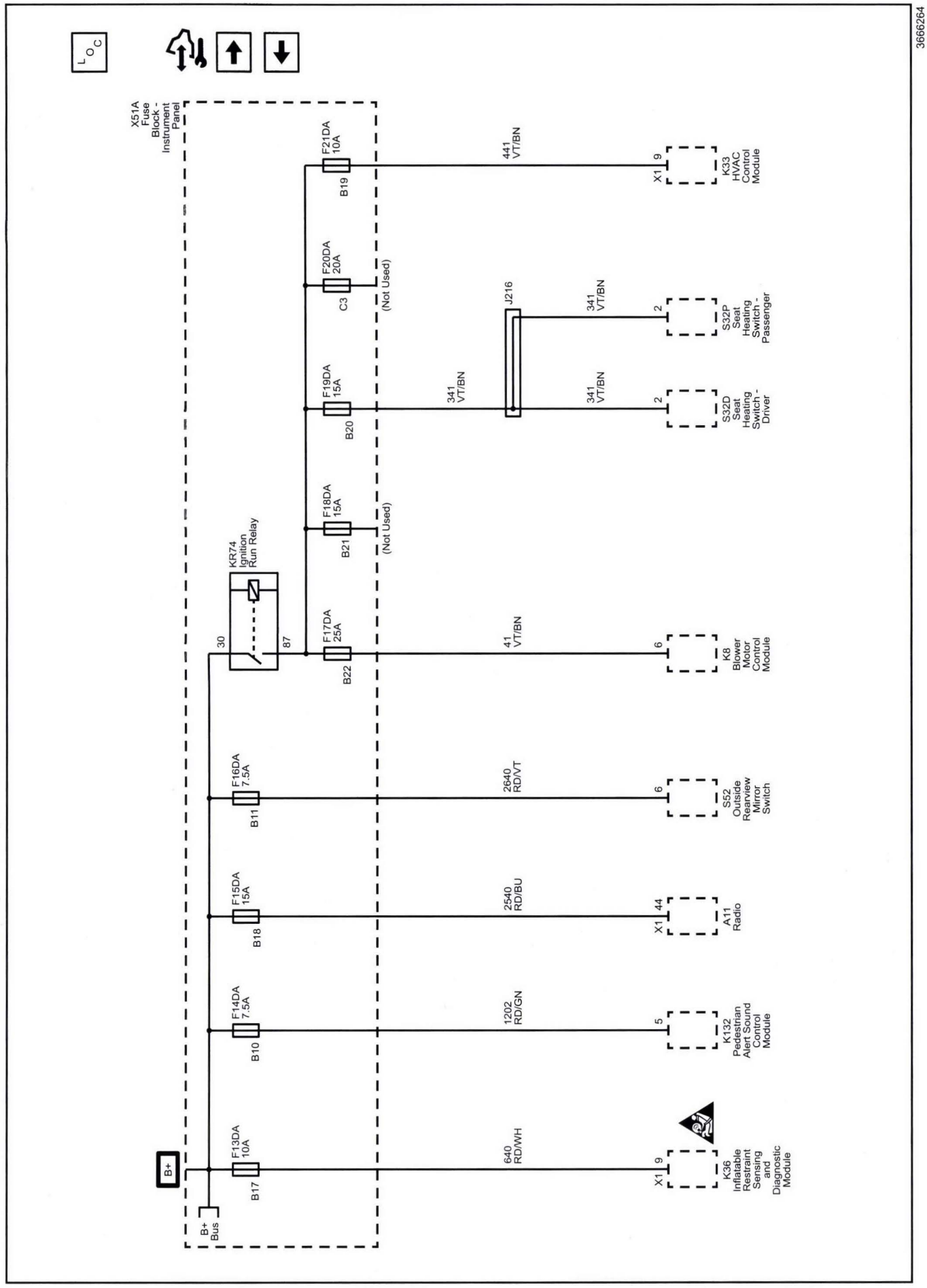
Power Distribution Schematics (F32UA, F33UA, F34UA, F35UA, F36UA, F37UA and F38UA)



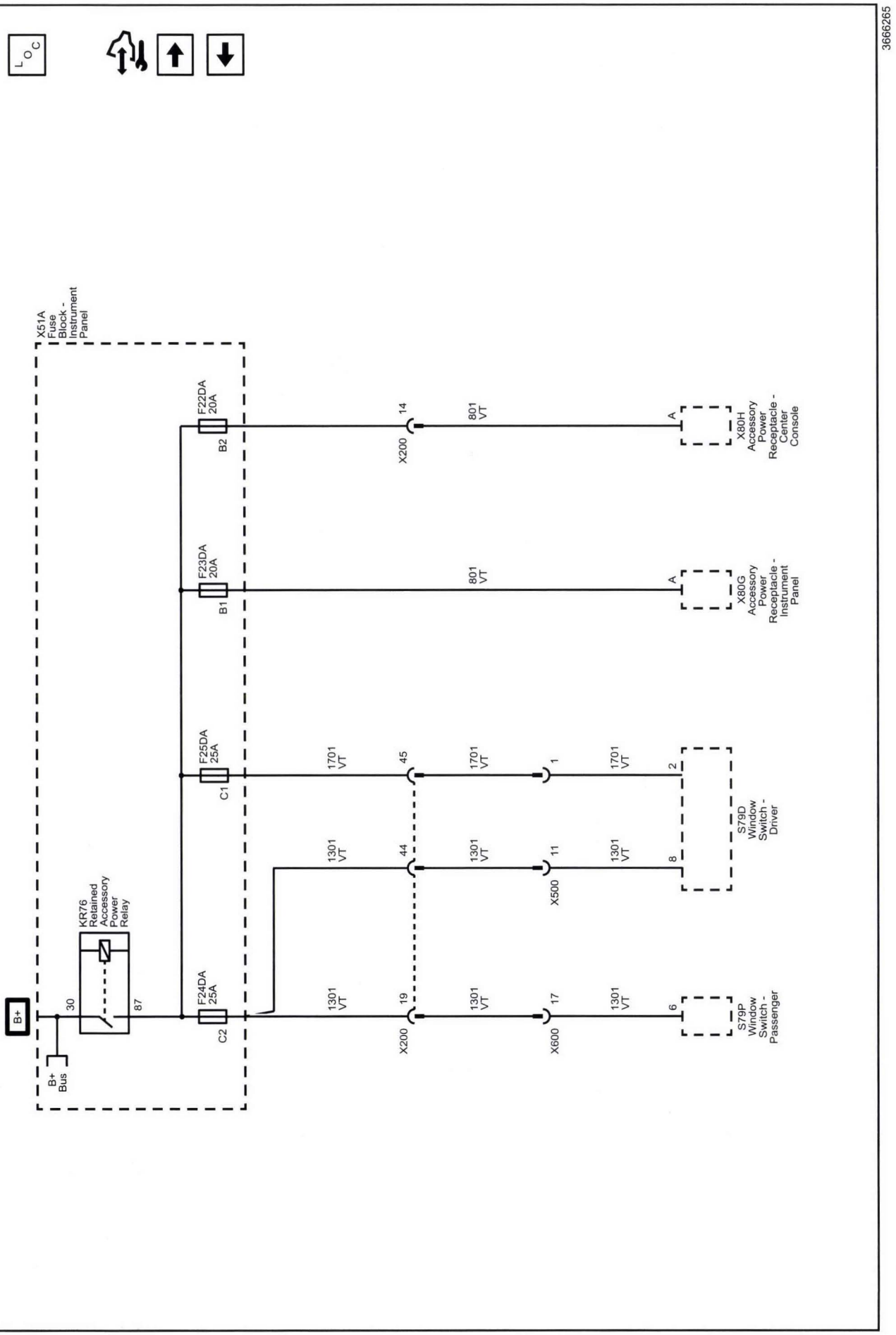
Power Distribution Schematics (F1DA, F2DA, F3DA, F4DA, F5DA, F6DA, F7DA, F8DA, F9DA, F10DA, F11DA, and F12DA Fuses)



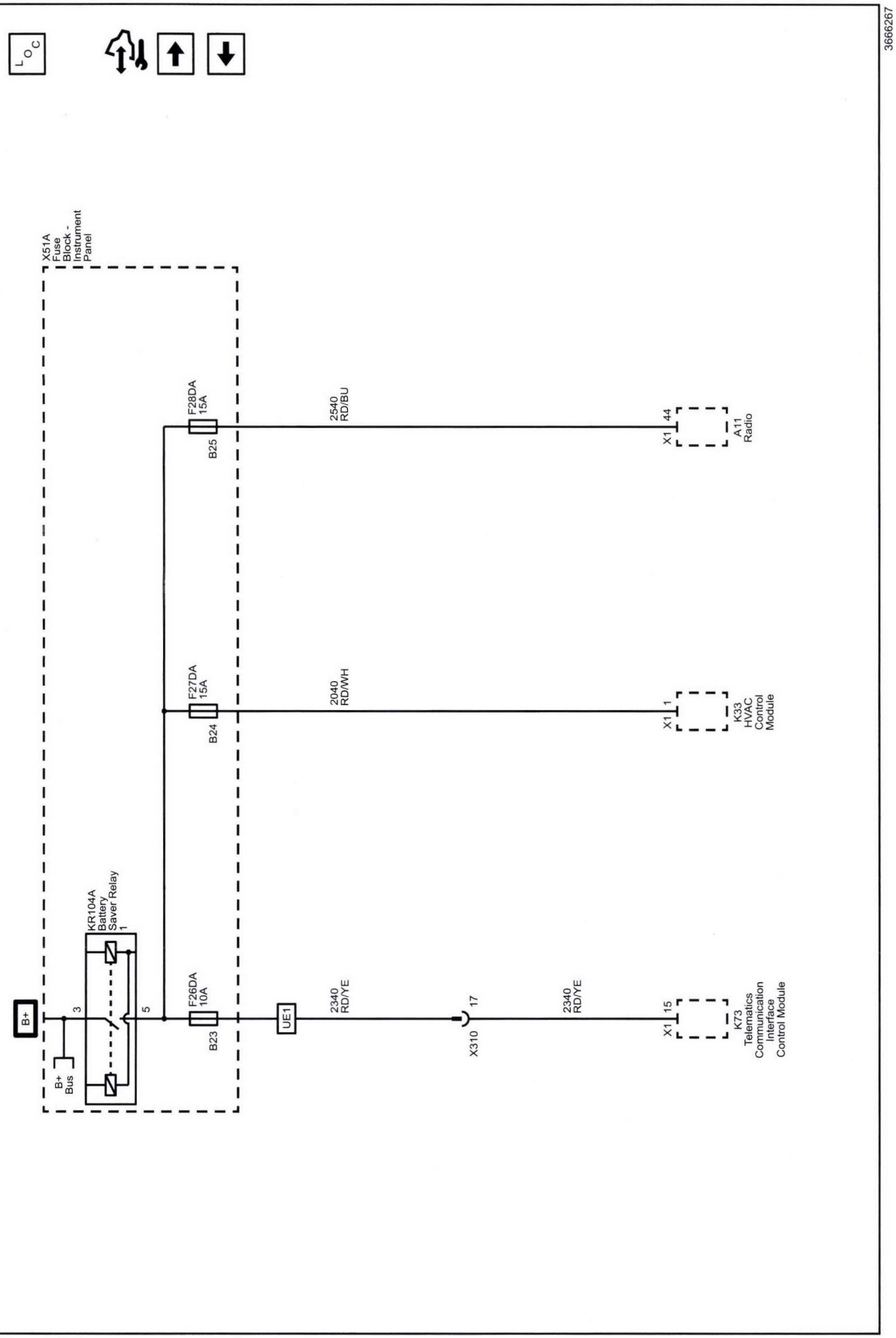
Power Distribution Schematics (F13DA, F14DA, F15DA, F16DA, F17DA, F18DA, F19DA, F20DA, and F21DA Fuses)



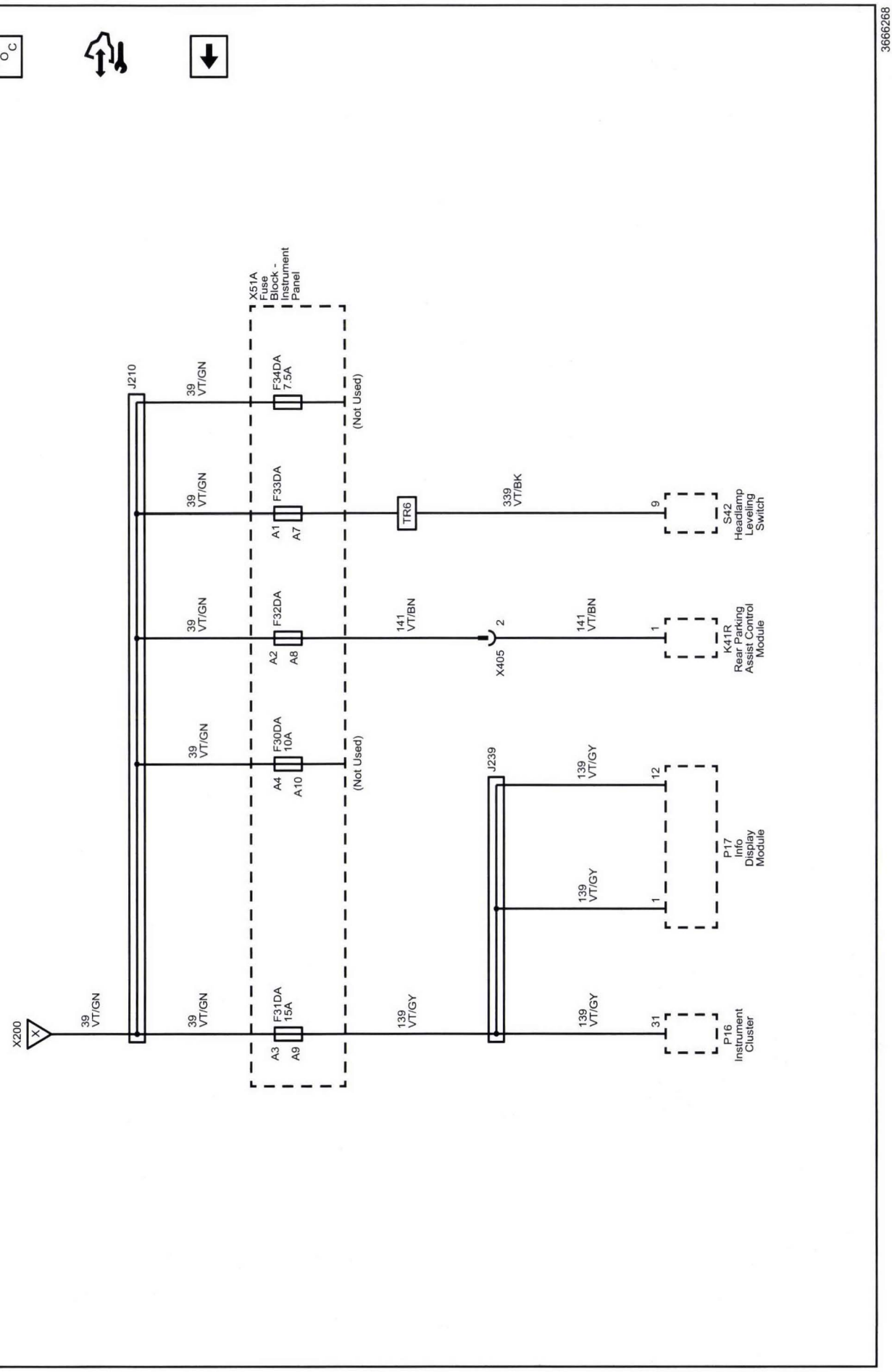
Power Distribution Schematics (F22DA, F23DA, F24DA, and F25DA Fuses)



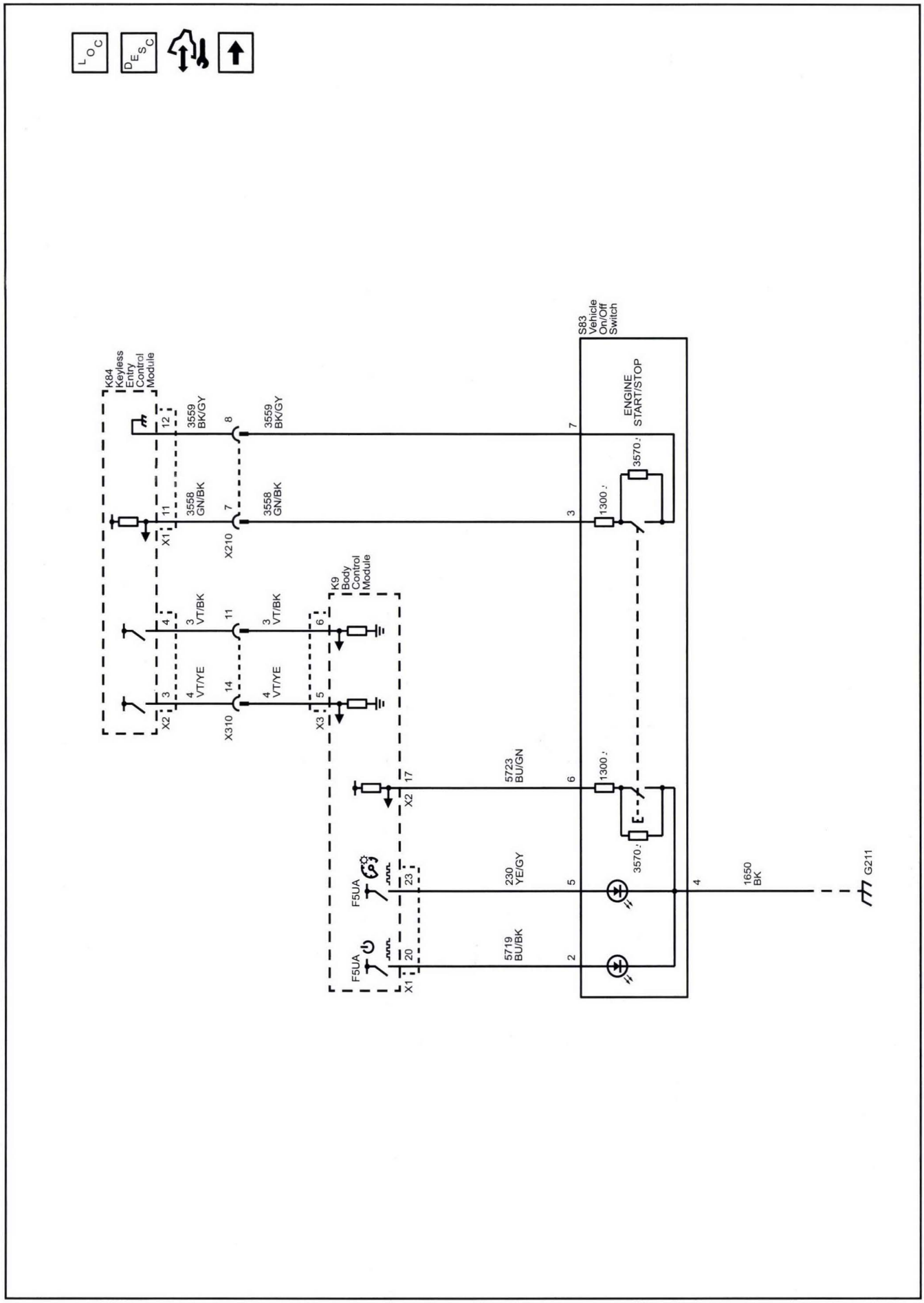
Power Distribution Schematics (F26DA, F27DA, and F28DA Fuses)



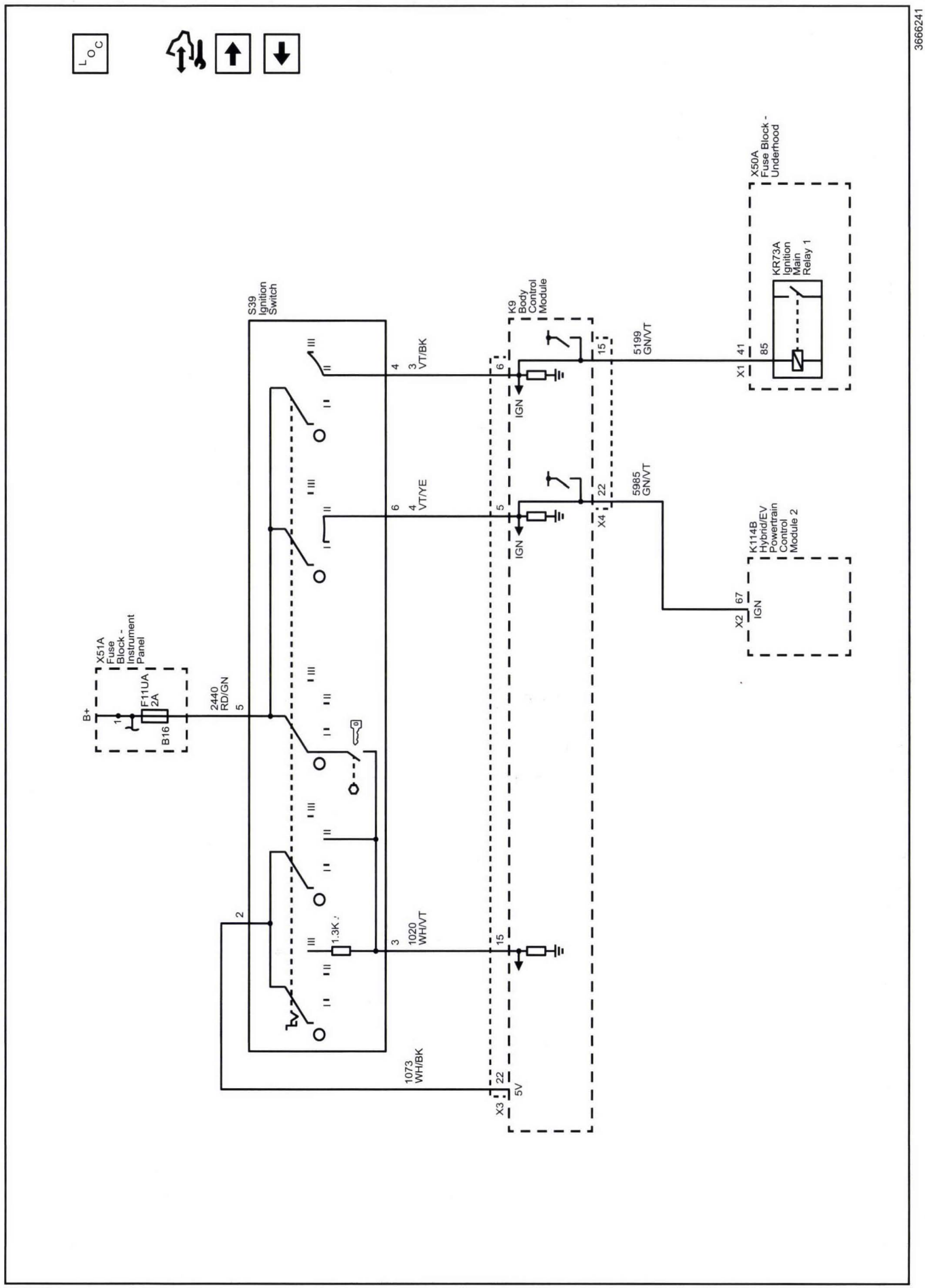
Power Distribution Schematics (F30DA, F31DA, F32DA, F33DA and F34DA Fuses)



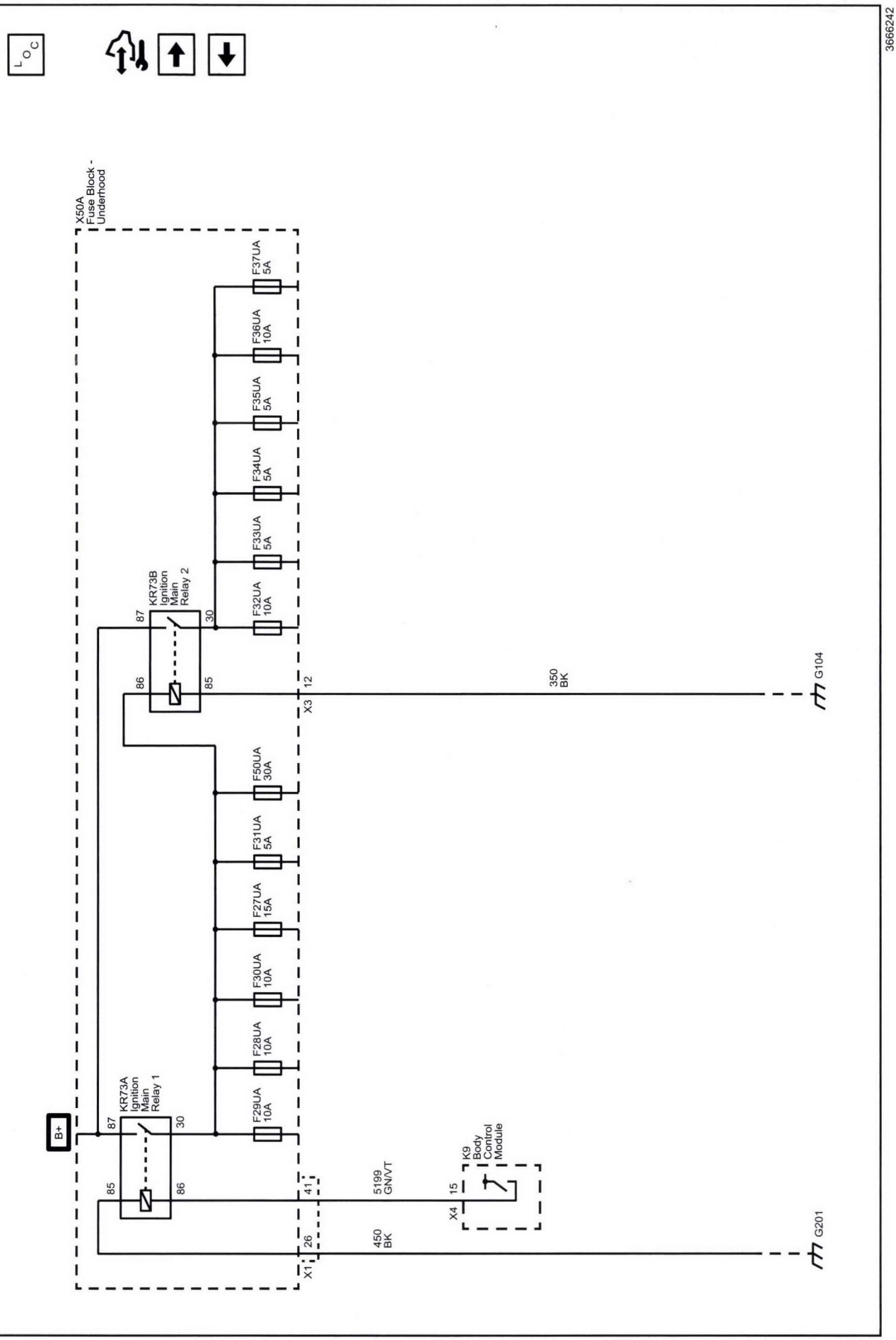
Power Moding Schematics (Ignition Mode Switch (BTM))



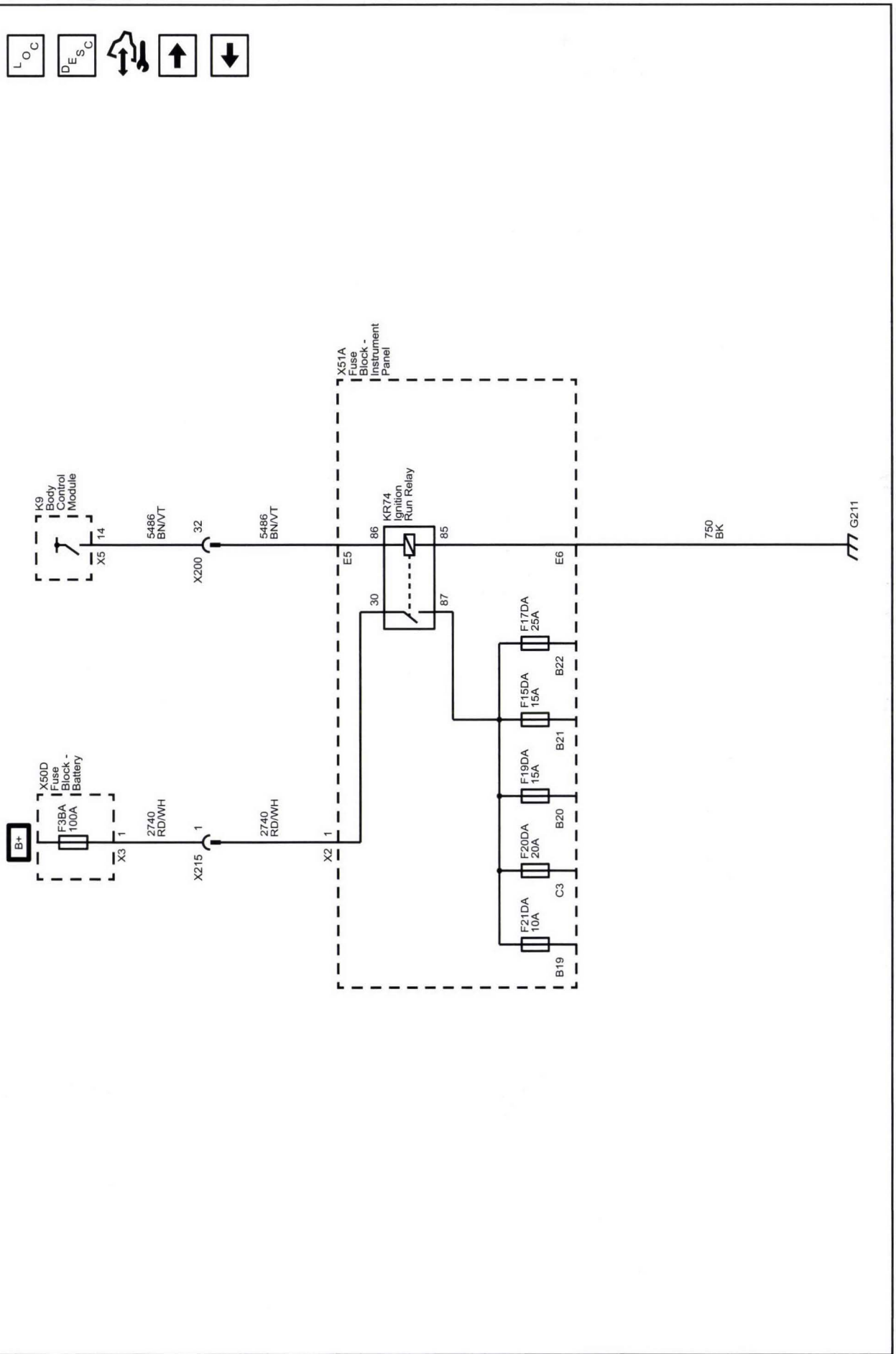
Power Moding Schematics (Ignition Switch (without BTM) and Ignition Power)



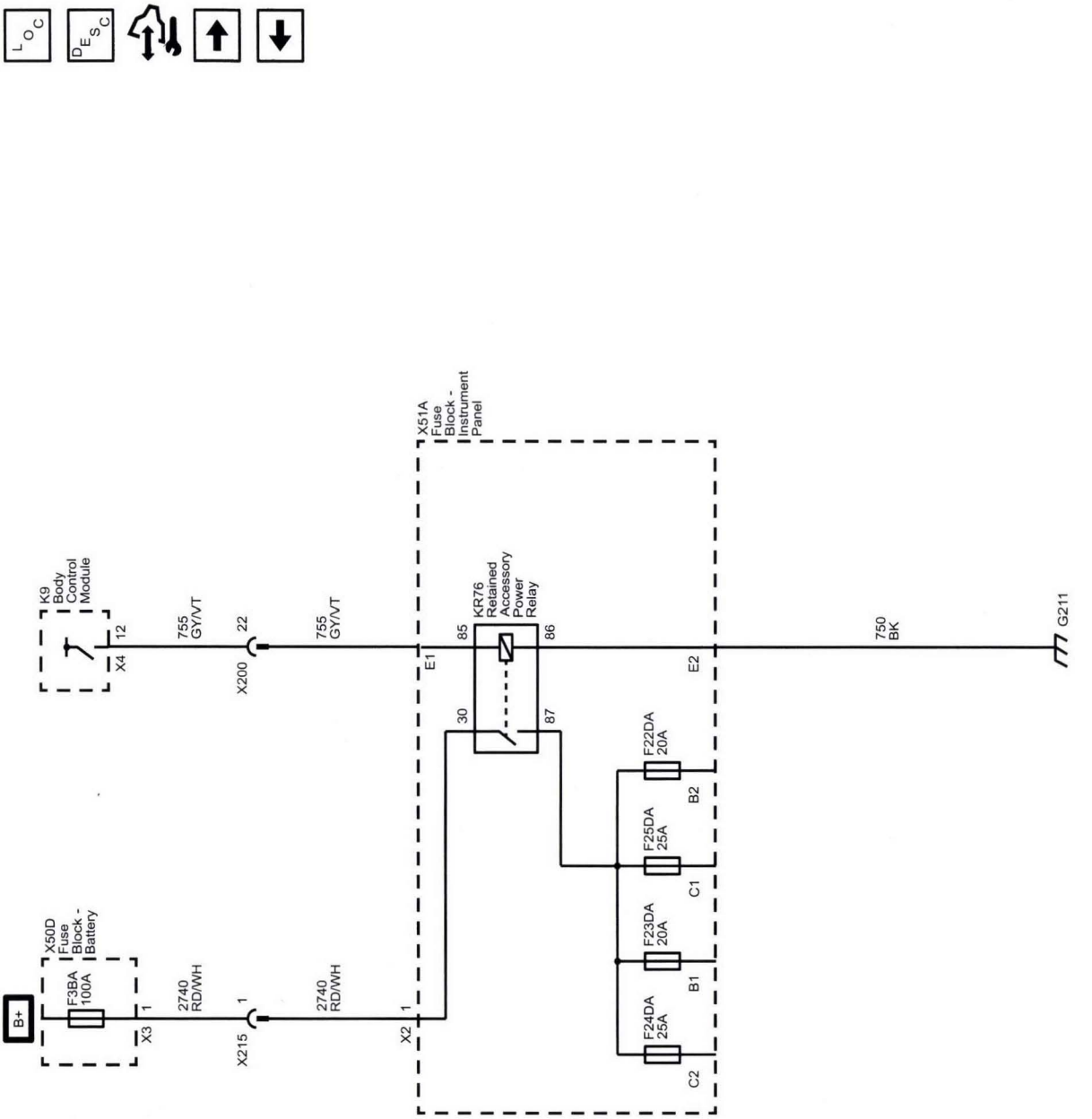
Power Moding Schematics (Ignition Main Relay 1 and 2)



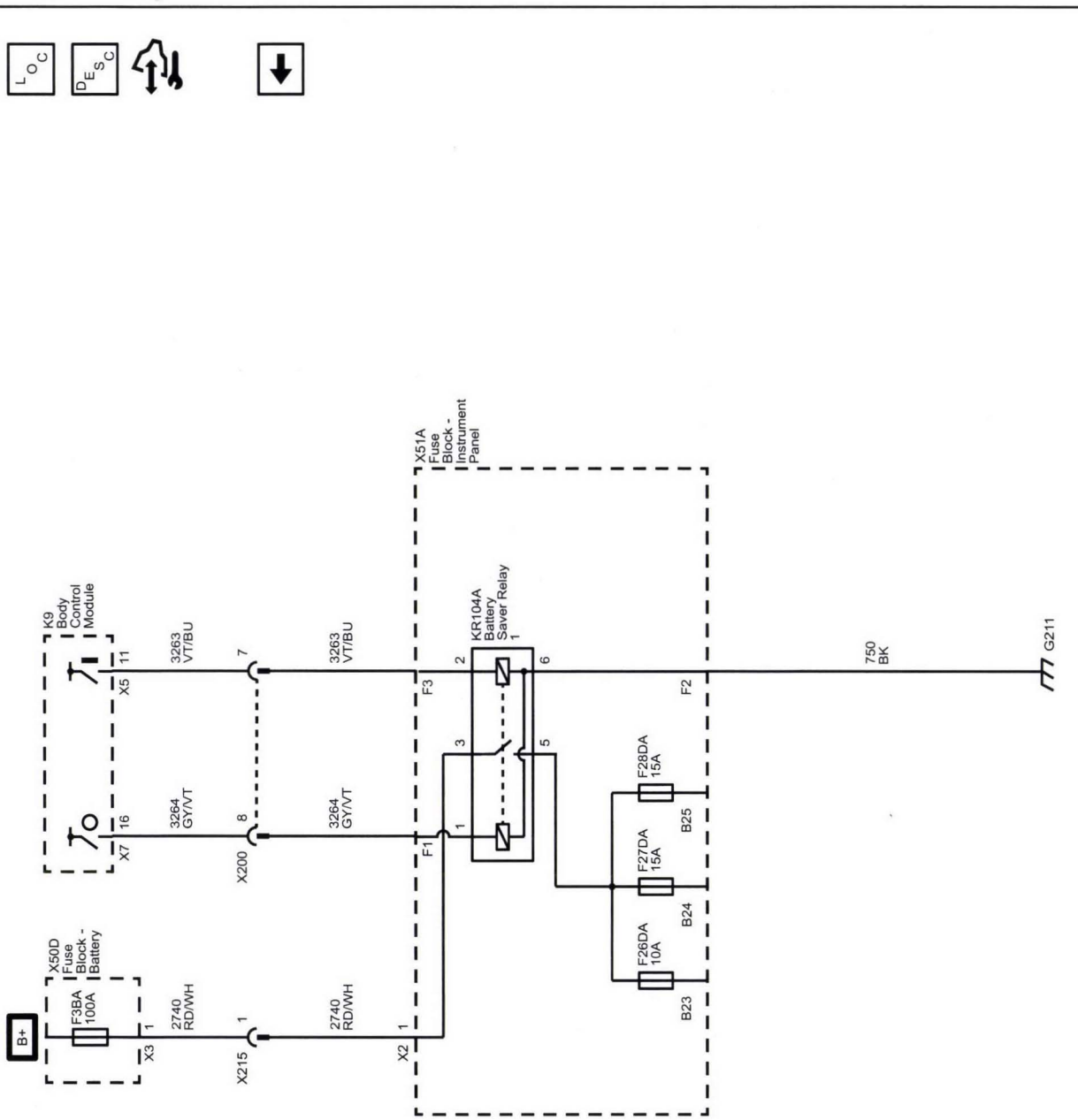
Power Moding Schematics (Ignition Run Relay)



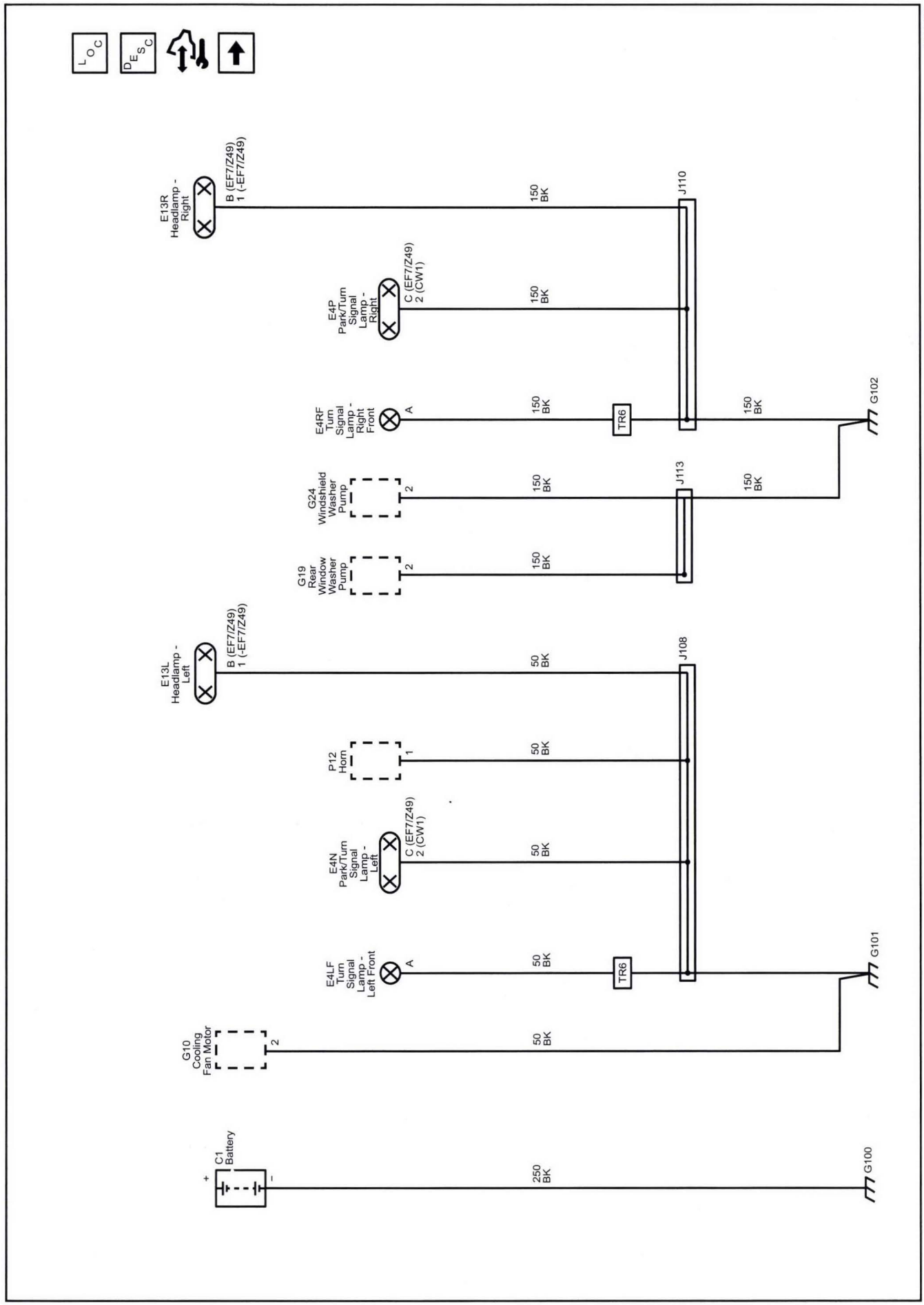
Power Moding Schematics (Accessory Power)



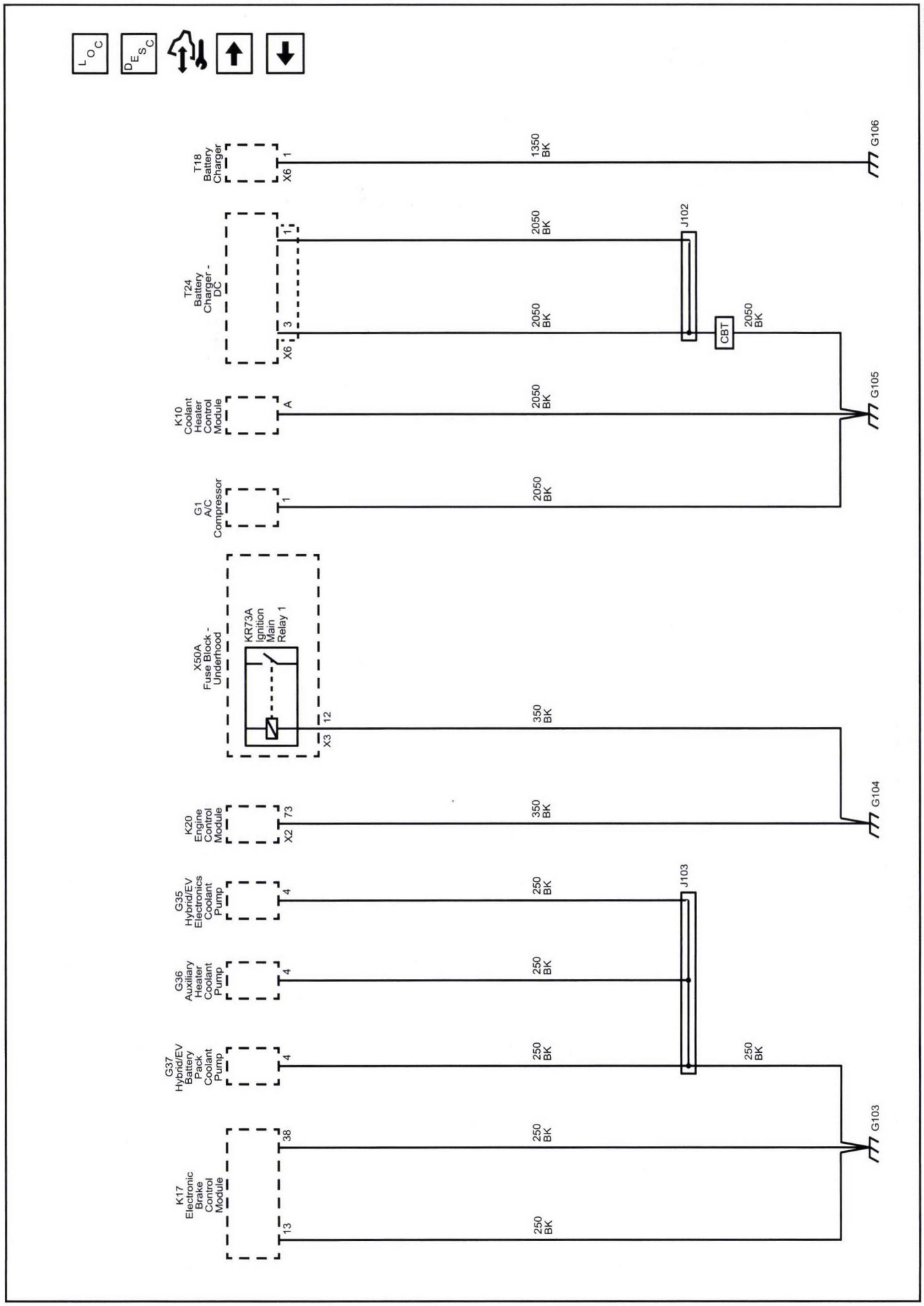
Power Moding Schematics (Battery Saver Relay)



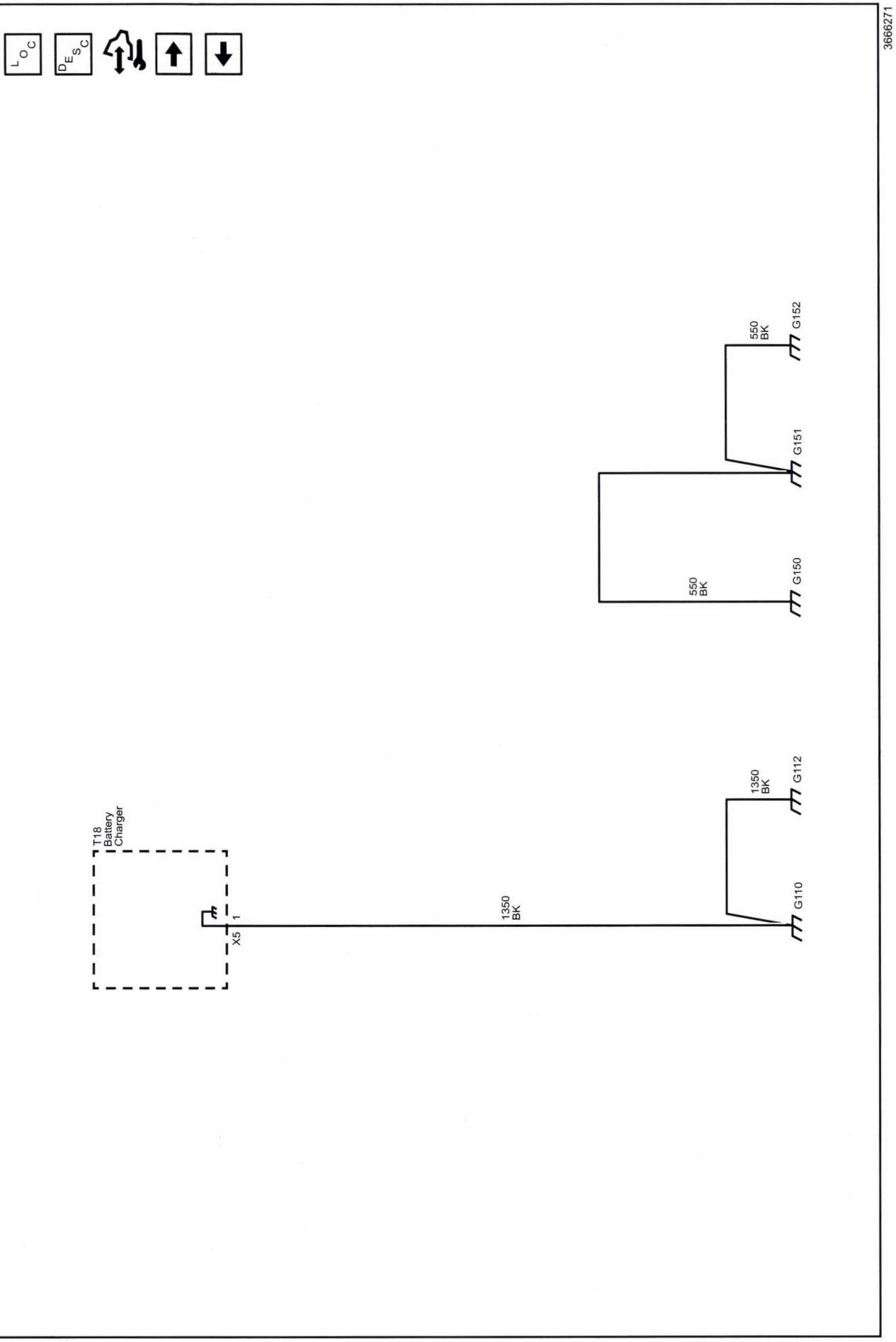
Ground Distribution Schematics (G100, G101 and G102)



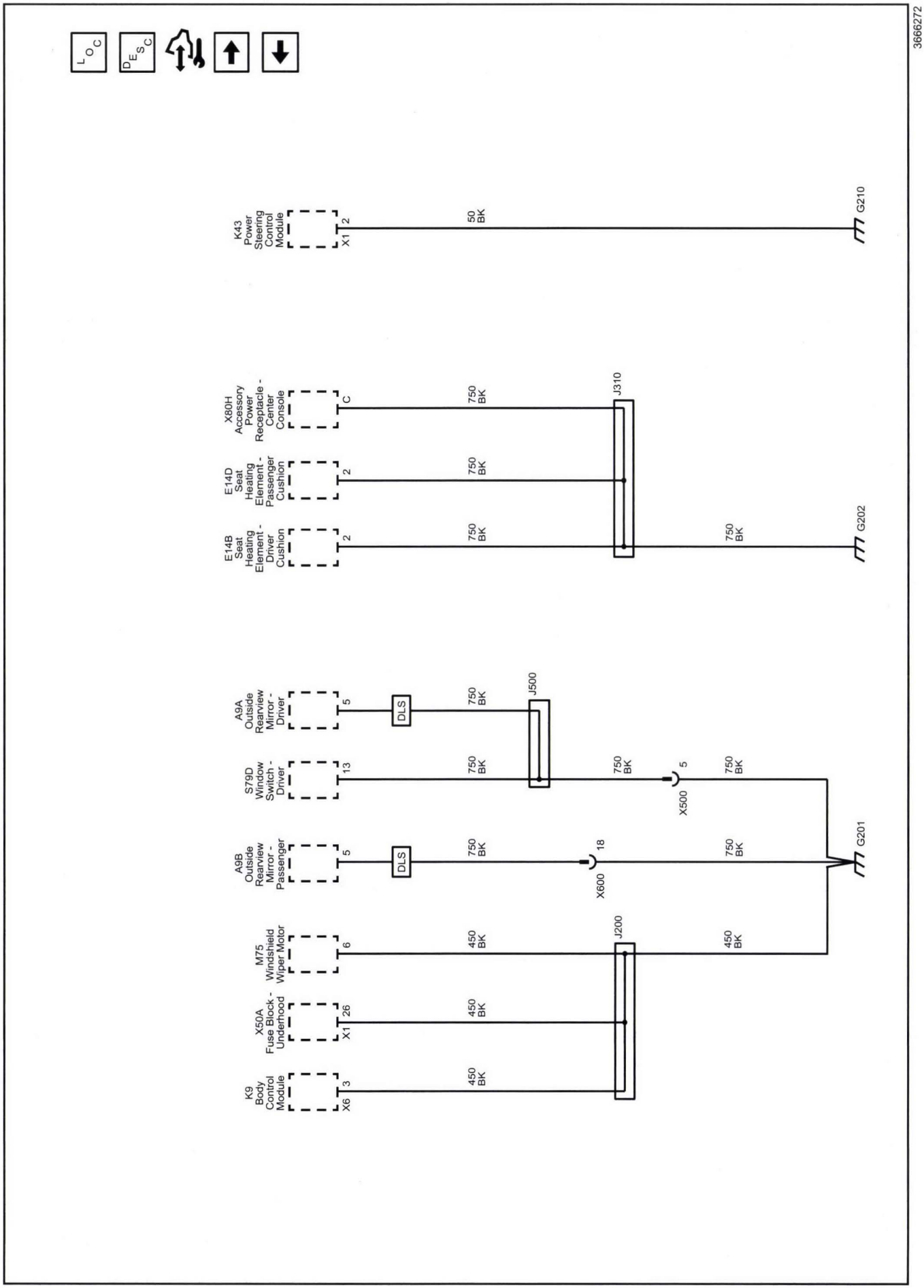
Ground Distribution Schematics (G103, G104, G105 and G106)



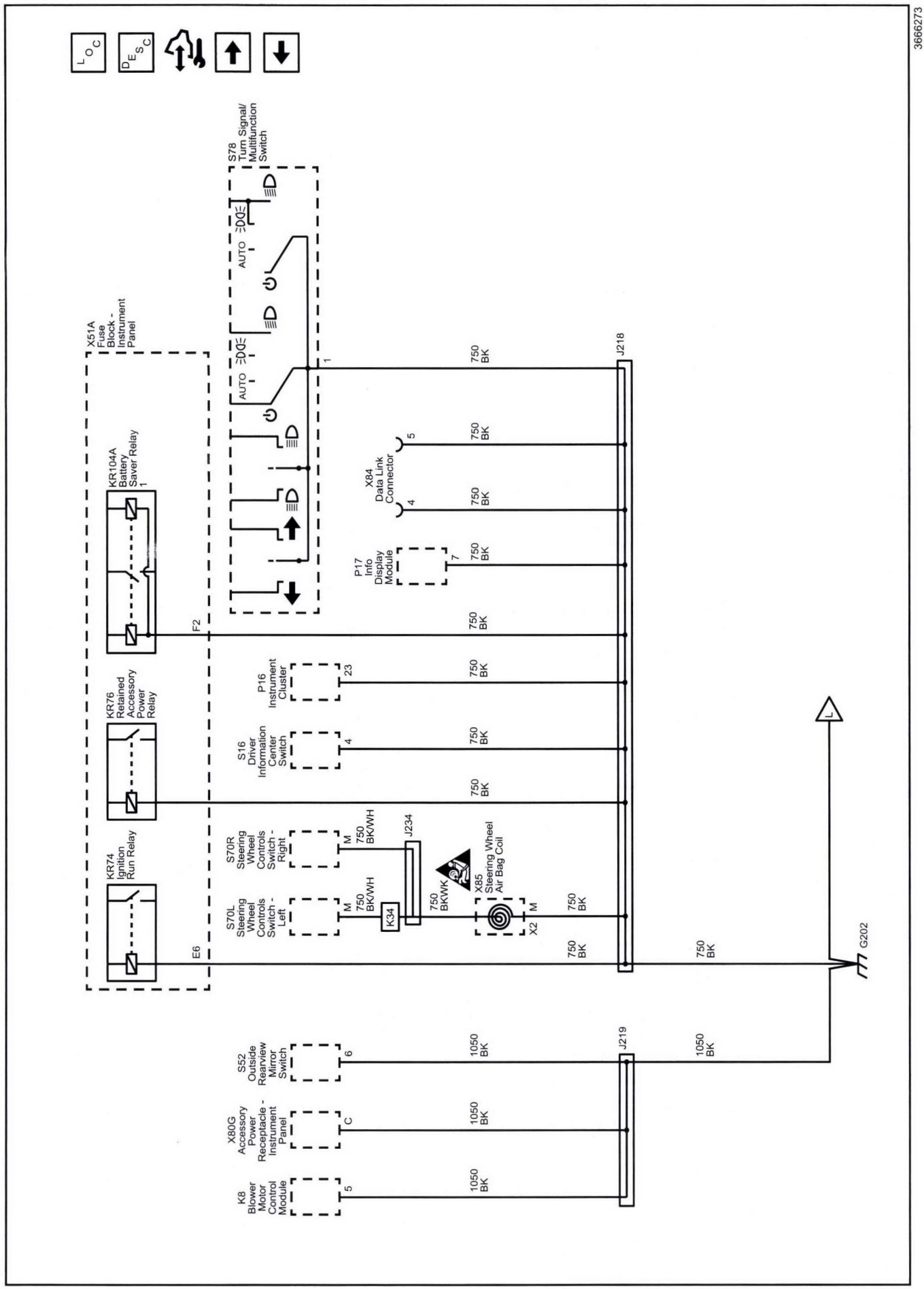
Ground Distribution Schematics (G110, G112, G150, G151 and G152)



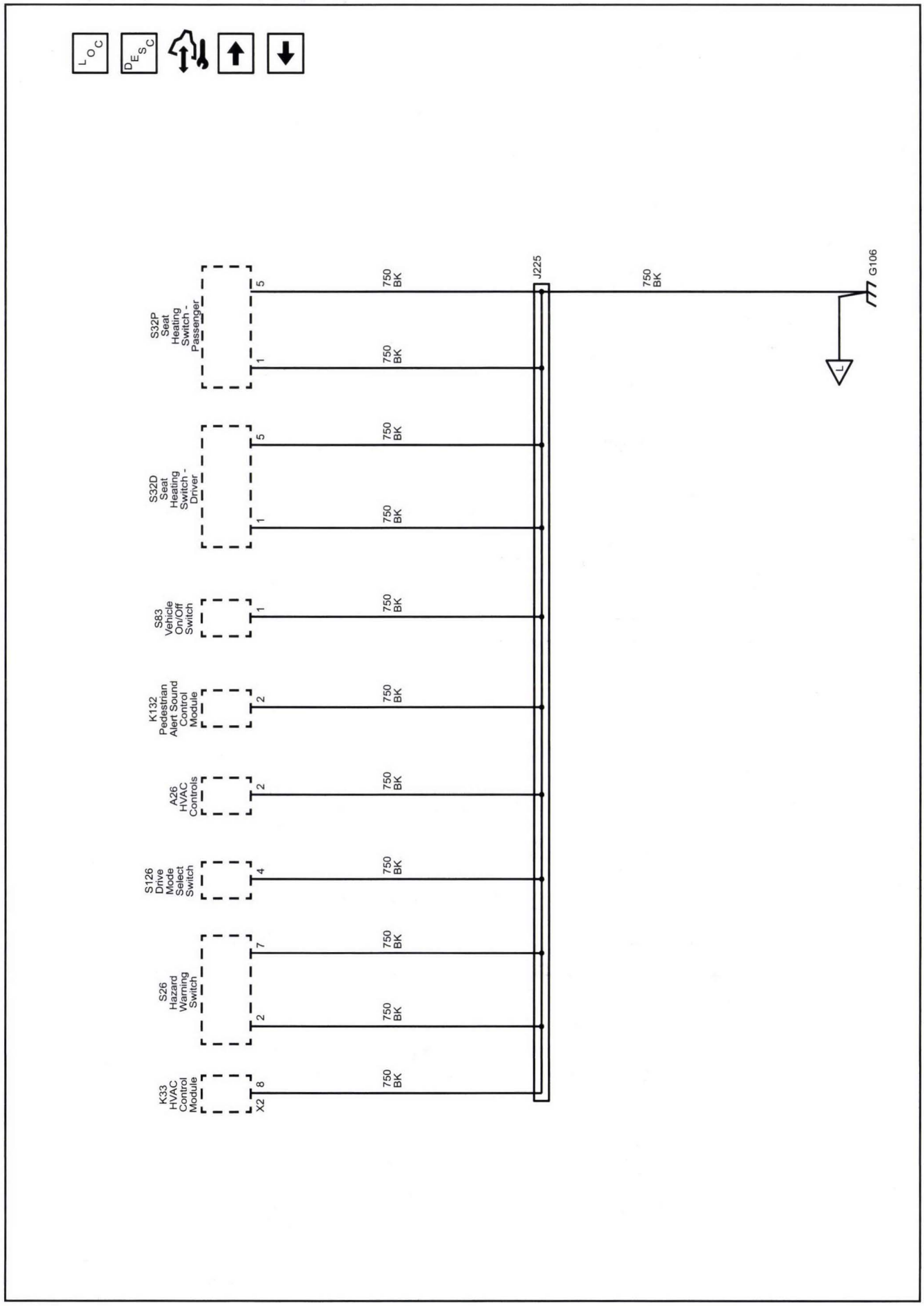
Ground Distribution Schematics (G201, G202 and G210)



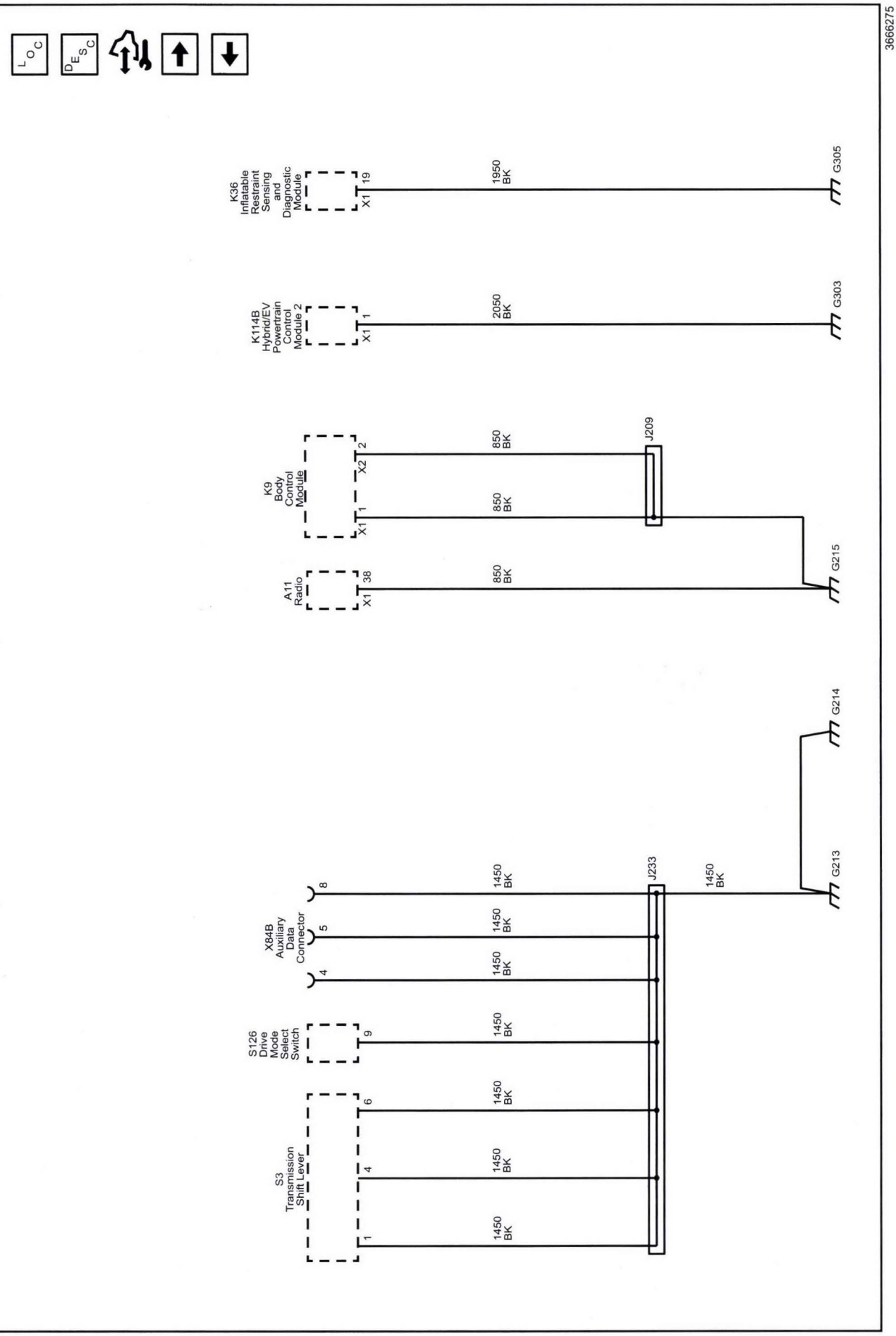
Ground Distribution Schematics (G211 (1 of 2))



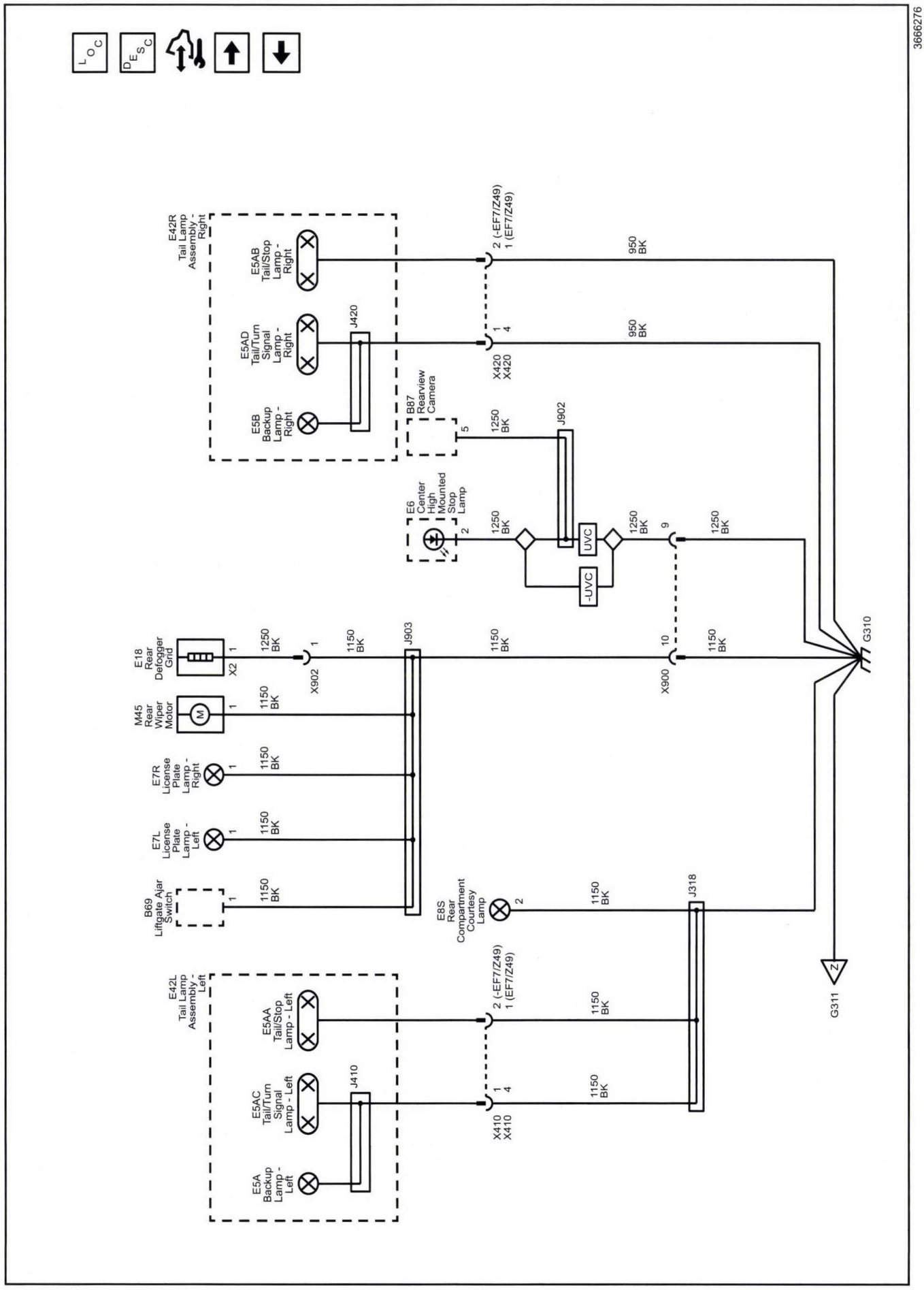
Ground Distribution Schematics (G211 (2 of 2))



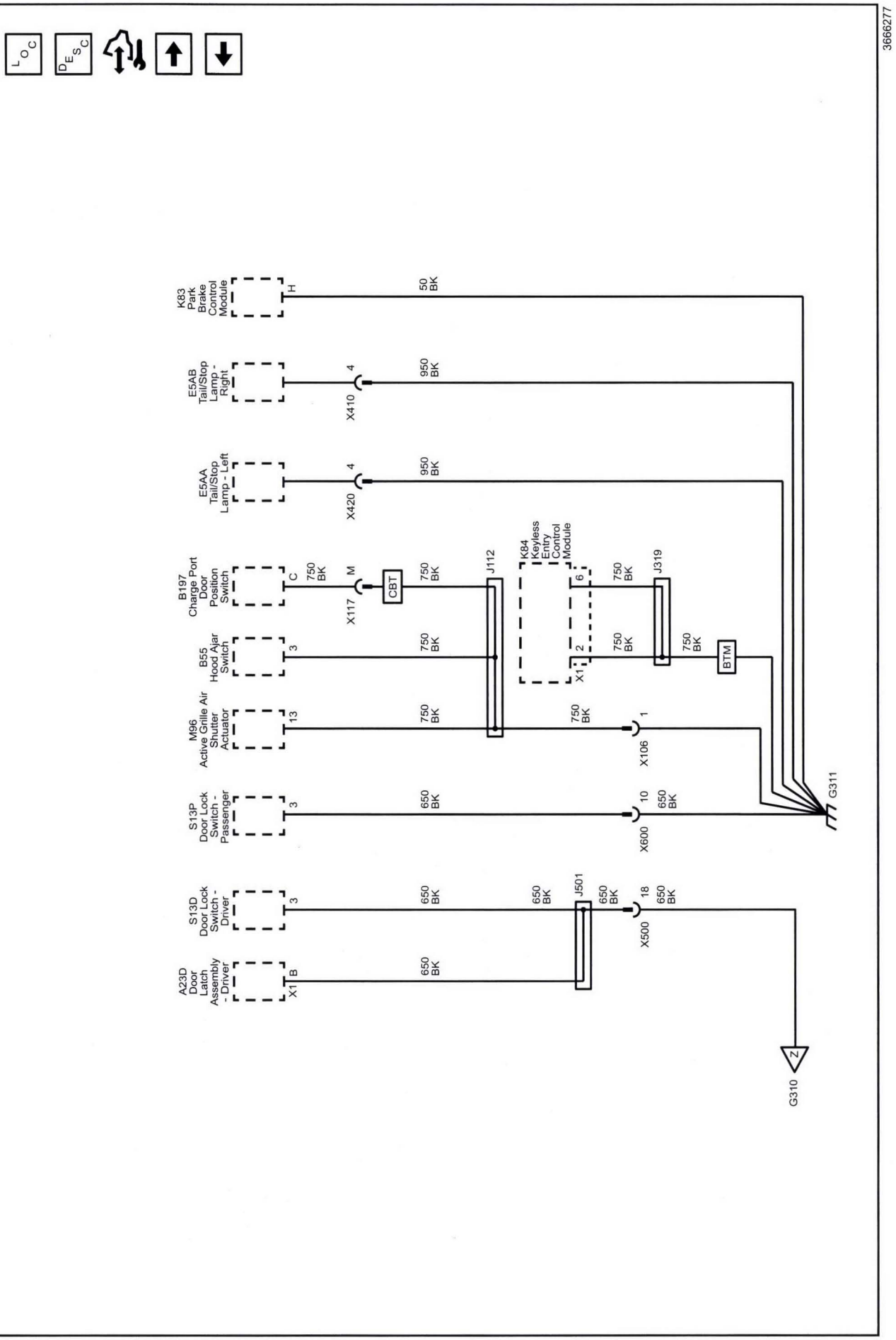
Ground Distribution Schematics (G213, G214, G215, G303 and G305)



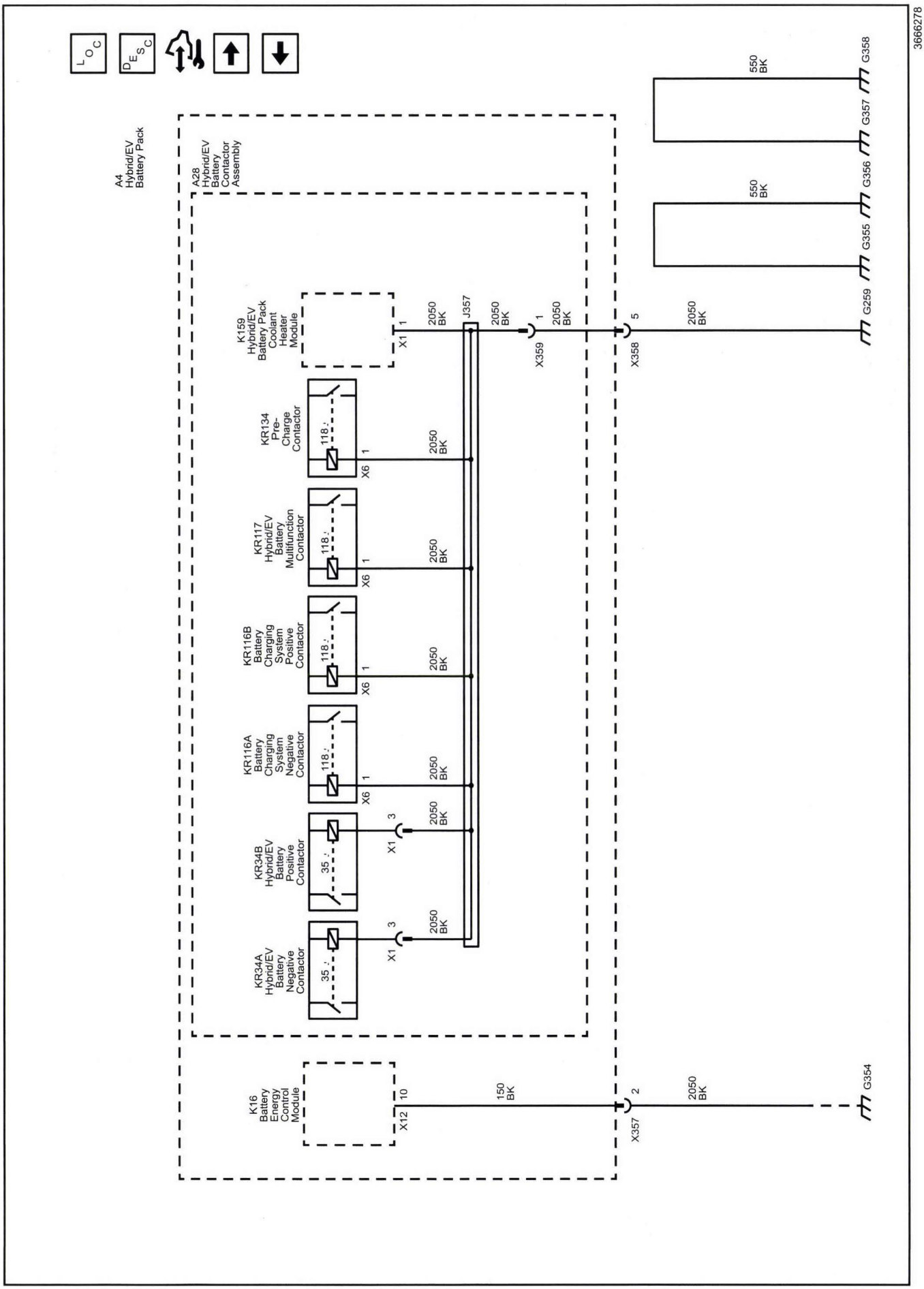
Ground Distribution Schematics (G310)



Ground Distribution Schematics (G311)



Ground Distribution Schematics (G254, G354, G355, G356, G357 and G358)



Component Locator

Master Electrical Component List

Code	Name	Option	Location	Locator View	Connector End View
A4	Hybrid/EV Battery Pack	—	Underbody in rear of vehicle mounted above the rear axle.	*Underbody - Hybrid/ EV Battery Pack Components (1 of 3) on page 11-406*	• *A4 Hybrid/EV Battery Pack X1 on page 11-455* • *A4 Hybrid/EV Battery Pack X2 on page 11-455*
A9A	Outside Rearview Mirror – Driver	—	On the outside of the driver door, near the front of the door	*Driver Door Components on page 11-395*	*A9A Outside Rearview Mirror - Driver on page 11-456*
A9B	Outside Rearview Mirror – Passenger	—	On the outside of the front passenger door, near the front of the door	*Passenger Door Components on page 11-397*	*A9B Outside Rearview Mirror - Passenger on page 11-457*
A11	Radio	—	In the passenger compartment, in the center of the instrument panel	*Front of Instrument Panel Components on page 11-383*	• *A11 Radio X1 on page 11-458* • *A11 Radio X2 on page 11-460* • *A11 Radio X3 on page 11-461* • *A11 Radio X4 on page 11-462*
A23D	Door Latch Assembly – Driver	—	Inside the driver door, at rear below middle	*Driver Door Components on page 11-395*	• *A23D Door Latch Assembly - Driver X1 on page 11-464* • *A23D Door Latch Assembly - Driver X2 on page 11-465*
A23LR	Door Latch Assembly - Left Rear	—	Inside the left rear door, at rear below middle	*Left Rear Door Components on page 11-398*	*A23LR Door Latch Assembly - Left Rear on page 11-466*
A23P	Door Latch Assembly - Passenger	—	Inside the passenger door, at rear below middle	*Front of Instrument Panel Components on page 11-383*	*A23P Door Latch Assembly - Passenger on page 11-467*
A23RR	Door Latch Assembly - Right Rear	—	Inside the right rear door, at rear below middle	*Right Rear Door Components on page 11-400*	*A23RR Door Latch Assembly - Right Rear on page 11-468*
A26	HVAC Controls	—	In the passenger compartment, front center, on instrument panel, below radio controls	*Front of Instrument Panel Components on page 11-383*	*A26 HVAC Controls on page 11-469*
A28	Hybrid/EV Battery Contactor Assembly	—	Inside Battery Pack Assembly in front of battery sections	—	—
B1	A/C Refrigerant Pressure Sensor	—	In the engine compartment in the high pressure line	*Back of Engine Compartment on page 11-379*	*B1 A/C Refrigerant Pressure Sensor on page 11-470*
B1C	A/C Low Side Pressure Sensor	—	In the engine compartment, attached to the A/C line	*Back of Engine Compartment on page 11-379*	*B1C A/C Refrigerant Pressure Sensor on page 11-471*
B5LF	Wheel Speed Sensor – Left Front	—	Near the left front wheel, to the rear of the knuckle	*Underbody - Wheel Components on page 11-410*	*B5LF Wheel Speed Sensor - Left Front on page 11-472*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
B5LR	Wheel Speed Sensor – Left Rear	—	Near the left rear wheel, inside the hub	*Underbody - Wheel Components on page 11-410*	*B5LR Wheel Speed Sensor - Left Rear on page 11-473*
B5RF	Wheel Speed Sensor – Right Front	—	Near the right front wheel, to the rear of the knuckle	*Underbody - Wheel Components on page 11-410*	*B5RF Wheel Speed Sensor - Right Front on page 11-474*
B5RR	Wheel Speed Sensor – Right Rear	—	Near the right rear wheel, inside the hub	*Underbody - Wheel Components on page 11-410*	*B5RR Wheel Speed Sensor - Right Rear on page 11-475*
B7A	Inside Air Temperature Sensor	—	In the passenger compartment, behind the instrument panel, attached to the left upper HVAC duct	*HVAC Assembly Components on page 11-384*	*B7A Inside Air Temperature Sensor on page 11-476*
B7B	Air Temperature Sensor - Duct Lower	—	In the passenger compartment, behind the instrument panel, attached to the left lower HVAC duct	*Front of Instrument Panel Components on page 11-383*	*B7B Air Temperature Sensor - Duct Lower on page 11-477*
B7F	Air Temperature Sensor - Duct Upper	—	In the passenger compartment, behind the instrument panel, attached to the left upper HVAC duct	*Front of Instrument Panel Components on page 11-383*	*B7F Air Temperature Sensor - Duct Upper on page 11-478*
B9	Ambient Air Temperature Sensor	—	On the front of the vehicle, to the right of the A/C condenser, mounted in the grill	*Front of Vehicle on page 11-374*	*B9 Ambient Air Temperature Sensor on page 11-479*
B10B	Ambient Light/ Sunload Sensor	—	In the passenger compartment, at the top center of the instrument panel	*Front of Instrument Panel Components on page 11-383*	*B10B Ambient Light/ Sunload Sensor on page 11-480*
B13	Transmission Fluid Temperature Sensor	—	In the engine compartment, internal to the automatic transmission assembly	—	*B13 Transmission Fluid Temperature Sensor on page 11-481*
B15	Transmission Internal Mode Switch	—	In the engine compartment, internal to the automatic transmission assembly	—	*B15 Transmission Internal Mode Switch on page 11-482*
B18	Battery Current Sensor	—	In the engine compartment, left front, forward of battery, mounted to battery negative cable	*Left Side Engine Compartment on page 11-376*	*B18 Battery Current Sensor on page 11-483*
B20	Brake Fluid Level Switch	—	In the left rear of the engine compartment, at the bottom of the brake fluid reservoir	*Left Side Engine Compartment on page 11-376*	*B20 Brake Fluid Level Switch on page 11-484*
B22	Brake Pedal Position Sensor	—	In the passenger compartment, left front, left of accelerator pedal, mounted to bracket on lower bulkhead	*Left Front of Passenger Compartment Components on page 11-393*	*B22 Brake Pedal Position Sensor on page 11-485*
B24	Cellular Phone Microphone	UE1	In the passenger compartment, at the front of the headliner, next to the dome lamp	• *Headliner Components (-UE1) on page 11-391* • *Headliner Components (UE1) on page 11-392*	*B24 Cellular Phone Microphone on page 11-486*
B28D	Door Ajar Switch – Driver	—	In the driver door jamb, in the B-pillar, below the door latch striker	*Left Front of Passenger Compartment Components on page 11-393*	*B28D Door Ajar Switch - Driver on page 11-487*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
B28LR	Door Ajar Switch – Left Rear	—	In the left rear door jamb, below the door latch striker	*Left Side Luggage Compartment Components on page 11-401*	*B28LR Door Ajar Switch - Left Rear on page 11-488*
B28P	Door Ajar Switch – Passenger	—	In the front passenger door jamb, in the B-pillar, below the door latch striker	*Right Front of Passenger Compartment Components on page 11-394*	*B28P Door Ajar Switch - Passenger on page 11-489*
B28RR	Door Ajar Switch – Right Rear	—	In the right rear door jamb, below the door latch striker	*Right Side Luggage Compartment Components on page 11-402*	*B28RR Door Ajar Switch - Right Rear on page 11-490*
B30	Hybrid/EV Battery Pack Current Sensor	—	Under the vehicle, in the Hybrid/EV battery part of Hybrid/EV battery module.	*Underbody - Hybrid/EV Battery Pack Components (2 of 3) on page 11-407*	*B30 Hybrid/EV Battery Pack Current Sensor on page 11-491*
B32A	Hybrid/EV Battery Temperature Sensor 1	—	Under the vehicle, in the Hybrid/EV battery part of Hybrid/EV battery module 1	*Underbody - Hybrid/EV Battery Pack Components (2 of 3) on page 11-407*	*B32A Hybrid/EV Battery Temperature Sensor 1 on page 11-492*
B32B	Hybrid/EV Battery Temperature Sensor 2	—	Under the vehicle, in the Hybrid/EV battery part of Hybrid/EV battery module 2	*Underbody - Hybrid/EV Battery Pack Components (2 of 3) on page 11-407*	*B32B Hybrid/EV Battery Temperature Sensor 2 on page 11-493*
B32C	Hybrid/EV Battery Temperature Sensor 3	—	Under the vehicle, in the Hybrid/EV battery part of Hybrid/EV battery module 3	*Underbody - Hybrid/EV Battery Pack Components (2 of 3) on page 11-407*	*B32C Hybrid/EV Battery Temperature Sensor 3 on page 11-494*
B32D	Hybrid/EV Battery Temperature Sensor 4	—	Under the vehicle, in the Hybrid/EV battery part of Hybrid/EV battery module 4	*Underbody - Hybrid/EV Battery Pack Components (2 of 3) on page 11-407*	*B32D Hybrid/EV Battery Temperature Sensor 4 on page 11-495*
B32E	Hybrid/EV Battery Temperature Sensor 5	—	Under the vehicle, in the Hybrid/EV battery part of Hybrid/EV battery module 5	*Underbody - Hybrid/EV Battery Pack Components (2 of 3) on page 11-407*	*B32E Hybrid/EV Battery Temperature Sensor 5 on page 11-496*
B32F	Hybrid/EV Battery Temperature Sensor 6	—	Under the vehicle, in the Hybrid/EV battery part of Hybrid/EV battery module 6	*Underbody - Hybrid/EV Battery Pack Components (2 of 3) on page 11-407*	*B32F Hybrid/EV Battery Temperature Sensor 6 on page 11-497*
B39	A/C Evaporator Temperature Sensor	—	In the passenger compartment, behind the passenger side of the instrument panel	—	*B39 AC Evaporator Temperature Sensor on page 11-498*
B55	Hood Ajar Switch	—	In the engine compartment, to the left of the hood latch	*Left Side Engine Compartment on page 11-376*	*B55 Hood Ajar Switch on page 11-499*
B59L	Front Impact Sensor – Left	D90/AYF/AW7	In the engine compartment, left of the hood latch	*Front of Engine Compartment on page 11-378*	*B59L Front Impact Sensor - Left on page 11-500*
B59R	Front Impact Sensor - Right	D90/AYF/AW7	In the engine compartment, right of the hood latch	*Front of Engine Compartment on page 11-378*	*B59R Front Impact Sensor - Right on page 11-501*
B60	Passenger Presence Sensor	AW7	In the passenger compartment, right forward of center, under the passenger seat.	*Passenger Seat Components on page 11-389*	*B60 Passenger Presence Sensor (AW7) on page 11-502*
B61P	Seat Belt Tension Sensor - Passenger	AYF	Part of Passenger Seat Belt Buckle	*Passenger Seat Components on page 11-389*	—

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
B63LF	Side Impact Sensor - Left Front	AYF/AW7	In the driver door, near middle, mounted to door beam	*Driver Door Components on page 11-395*	*B63LF Side Impact Sensor - Left Front on page 11-503*
B63LR	Side Impact Sensor - Left Rear	AYF/AW7	In the passenger compartment, left rear, near outboard seat belt anchor bolt	*Left Front of Passenger Compartment Components on page 11-393*	*B63LR Side Impact Sensor - Left Rear on page 11-504*
B63RF	Side Impact Sensor - Right Front	AYF/AW7	In the passenger door, near middle, mounted to door beam	*Passenger Door Components on page 11-397*	*B63RF Side Impact Sensor - Right Front on page 11-505*
B63RR	Side Impact Sensor - Right Rear	AYF/AW7	In the passenger compartment, right rear, near outboard seat belt anchor bolt	*Right Front of Passenger Compartment Components on page 11-394*	*B63RR Side Impact Sensor - Right Rear on page 11-506*
B69	Liftgate Ajar Switch	—	In the cargo area, near the bottom center of the liftgate	*Liftgate Components on page 11-403*	*B69 Liftgate Ajar Switch on page 11-507*
B78G	Rear Object Sensor - Left Outer (UD7)	UD7	At the rear of the vehicle, mounted to the fascia, near left corner	*Rear of Vehicle Components on page 11-404*	*B78G Rear Object Sensor - Left Outer (UD7) on page 11-508*
B78H	Rear Object Sensor - Right Outer (UD7)	UD7	At the rear of the vehicle, mounted to the fascia, near right corner	*Rear of Vehicle Components on page 11-404*	*B78H Rear Object Sensor - Right Outer (UD7) on page 11-509*
B81B	Park Position Switch	—	In the passenger compartment, part of the automatic shift lever	—	—
B87	Rearview Camera	UV7	At the rear of vehicle, mounted to liftgate above license plate, left of center	*Rear of Vehicle Components on page 11-404*	*B87 Rearview Camera (UV7) on page 11-510*
B88D	Seat Belt Switch – Driver	AYF/AW7	In the passenger compartment, in the driver seat belt buckle	*Driver Seat Components on page 11-388*	*B88D Seat Belt Switch - Driver (AYF/AW7) on page 11-511*
B88P	Seat Belt Switch – Passenger	—	In the passenger compartment, in the passenger seat belt buckle	*Driver Seat Components on page 11-388*	*B88P Seat Belt Switch - Passenger (AW7) on page 11-512*
B107	Accelerator Pedal Position Sensor	—	In the passenger compartment, under the instrument panel near the accelerator pedal	*Left Front of Passenger Compartment Components on page 11-393*	*B107 Accelerator Pedal Position Sensor on page 11-513*
B135	Coolant Heater Temperature Sensor	—	At the right rear of the engine compartment, mounted to the bulkhead, next to the coolant heater control module	*Front of Hybrid/EV Drive Unit on page 11-380*	*B135 Coolant Heater Temperature Sensor on page 11-514*
B137	Power Steering Shaft Torque Sensor	—	In the passenger compartment mounted to lower of the steering column	*Steering Column Components on page 11-386*	—
B153D	Seat Belt Buckle - Driver	—	In the passenger compartment mounted to the inboard side of the driver seat	*Driver Seat Components on page 11-388*	—
B153P	Seat Belt Buckle - Passenger	AL0	In the passenger compartment mounted to the inboard side of the passenger seat	*Passenger Seat Components on page 11-389*	*B153P Seat Belt Buckle - Passenger (AYF) on page 11-515*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
B160	Windshield Temperature and Inside Moisture Sensor	—	In the passenger compartment, front center, mounted to top of windshield, near inside rearview mirror	*Headliner Components (UE1) on page 11-392*	*B160 Windshield Temperature and Inside Moisture Sensor on page 11-516*
B197	Charge Port Door Position Switch	—	At the left front of the vehicle, behind the rear of the left front fender	—	—
B201	Brake Control Brake Pedal Position Sensor	—	In the passenger compartment, under the driver side of the instrument panel, mounted to the brake pedal	*Left Front of Passenger Compartment Components on page 11-393*	*B201 Brake Control Brake Pedal Position Sensor on page 11-518*
B202	Hybrid Electronics Coolant Temperature Sensor	—	At the right front of the engine compartment, mounted in the Hybrid/EV electronics radiator	*Front of Engine Compartment on page 11-378*	*B202 Hybrid Electronics Coolant Temperature Sensor on page 11-519*
B204A	Hybrid/EV Battery Pack Coolant Temperature Sensor 1	—	Internal component of Hybrid/EV Battery Pack. Mounted into inlet of battery pack heater	*Underbody - Hybrid/EV Battery Pack Components (2 of 3) on page 11-407*	*B204A Hybrid/EV Battery Pack Coolant Temperature Sensor 1 on page 11-520*
B204B	Hybrid/EV Battery Pack Coolant Temperature Sensor 2	—	Internal component of Hybrid/EV Battery Pack. Mounted into outlet of battery pack heater	*Underbody - Hybrid/EV Battery Pack Components (2 of 3) on page 11-407*	*B204B Hybrid/EV Battery Pack Coolant Temperature Sensor 2 on page 11-521*
B228	Drive Motor Position Sensor	—	In the engine compartment, internal to the automatic transmission assembly	*B228 Drive Motor Position Sensor on page 11-522*	*B228 Drive Motor Position Sensor on page 11-522*
B230	Hybrid/EV DC Charging Current Sensor	—	In the engine compartment mounted above the power inverter module part of the battery charger – DC	—	—
B258	Hybrid/EV Battery Coolant Level Switch	—	In the engine compartment, right side front mounted battery coolant bottle	*Front of Engine Compartment on page 11-378*	B258 Hybrid/EV Battery Coolant Level Switch
B281	Hybrid/EV Battery Charger Receptacle Lock Actuator Position Sensor	—	At the left front of the vehicle, behind the charging port door, part of Hybrid/EV Battery Charger Receptacle	—	—
B282	Hybrid/EV Battery Charger Receptacle Temperature Sensor	—	At the left front of the vehicle, behind the charging port door, part of Hybrid/EV Battery Charger Receptacle	—	—
C1	Battery	—	In the engine compartment, left side, near front, mounted to battery tray, below battery cover	*Left Side Engine Compartment on page 11-376*	*C1 Battery (-) on page 11-524*
C3	Telematics Communication Interface Control Module Battery	UE1	In the passenger compartment, behind the center of the instrument panel	*Left Front of Passenger Compartment Components on page 11-393*	*C3 Telematics Communication Interface Control Module Battery (UE1) on page 11-525*
C4A	Hybrid/EV Battery Section 1	—	Internal component to Hybrid/EV battery pack.	*Underbody - Hybrid/EV Battery Pack Components (3 of 3) on page 11-408*	*C4A Hybrid/EV Battery Section 1 on page 11-526*
C4B	Hybrid/EV Battery Section 2	—	Internal component to Hybrid/EV battery pack.	*Underbody - Hybrid/EV Battery Pack Components (3 of 3) on page 11-408*	*C4B Hybrid/EV Battery Section 2 on page 11-527*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
C4C	Hybrid/EV Battery Section 3	—	Internal component to Hybrid/EV battery pack.	*Underbody - Hybrid/ EV Battery Pack Components (3 of 3) on page 11-408*	*C4C Hybrid/EV Battery Section 3 on page 11-528*
C4D	Hybrid/EV Battery Section 4	—	Internal component to Hybrid/EV battery pack.	*Underbody - Hybrid/ EV Battery Pack Components (3 of 3) on page 11-408*	*C4D Hybrid/EV Battery Section 4 on page 11-529*
C4E	Hybrid/EV Battery Section 5	—	Internal component to Hybrid/EV battery pack.	*Underbody - Hybrid/ EV Battery Pack Components (3 of 3) on page 11-408*	*C4E Hybrid/EV Battery Section 5 on page 11-530*
C4F	Hybrid/EV Battery Section 6	—	Internal component to Hybrid/EV battery pack.	*Underbody - Hybrid/ EV Battery Pack Components (3 of 3) on page 11-408*	*C4F Hybrid/EV Battery Section 6 on page 11-531*
E4N	Park/Turn Signal Lamp – Left	—	In the left front corner of the vehicle, in the left headlamp assembly	*Front of Vehicle on page 11-374*	• *E4N Park/Turn Signal Lamp - Left (CW1) on page 11-532* • *E4N Park/Turn Signal Lamp - Left (EF7/Z49) on page 11-533*
E4P	Park/Turn Signal Lamp – Right	—	In the right front corner of the vehicle, in the right headlamp assembly	*Front of Vehicle on page 11-374*	• *E4P Park Turn Signal Lamp - Right (CW1) on page 11-534* • *E4P Park Turn Signal Lamp - Right (EF7/Z49) on page 11-535*
E4Y	Turn Signal Repeater Lamp – Left	DLS	In outside rearview mirror	—	—
E4Z	Turn Signal Repeater Lamp – Right	DLS	In outside rearview mirror	—	—
E5A	Backup Lamp – Left	—	In the left rear corner of the vehicle, in the left rear lamp assembly	*Rear of Vehicle Components on page 11-404*	*E5A Backup Lamp - Left on page 11-536*
E5AA	Tail/Stop Lamp – Left	—	In the left rear corner of the vehicle, in the left rear lamp assembly	*Rear of Vehicle Components on page 11-404*	*E5AA Tail/Stop Lamp - Left on page 11-537*
E5AB	Tail/Stop Lamp – Right	—	In the right rear corner of the vehicle, in the right rear lamp assembly	*Rear of Vehicle Components on page 11-404*	*E5AB Tail/Stop Lamp - Right on page 11-538*
E5AC	Tail/Turn Signal Lamp - Left	—	In the left rear corner of the vehicle, in the left rear lamp assembly	*Rear of Vehicle Components on page 11-404*	*E5AC Tail/Turn Signal Lamp - Left on page 11-539*
E5AD	Tail/Turn Signal Lamp - Right	—	In the right rear corner of the vehicle, in the right rear lamp assembly	*Rear of Vehicle Components on page 11-404*	*E5AD Tail/Turn Signal Lamp - Right on page 11-540*
E5B	Backup Lamp – Right	—	In the right rear corner of the vehicle, in the right rear lamp assembly	*Rear of Vehicle Components on page 11-404*	*E5B Backup Lamp - Right on page 11-541*
E6	Center High Mounted Stop Lamp	—	In the passenger compartment, at the top of the liftgate	*Rear of Vehicle Components on page 11-404*	*E6 Center High Mounted Stop Lamp on page 11-542*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
E7L	License Plate Lamp – Left	—	On the outside of the liftgate, near the outside handle	*Rear of Vehicle Components on page 11-404*	*E7L License Plate Lamp - Left on page 11-543*
E7R	License Plate Lamp – Right	—	On the outside of the liftgate, near the outside handle	*Rear of Vehicle Components on page 11-404*	*E7R License Plate Lamp - Right on page 11-544*
E8S	Rear Compartment Courtesy Lamp	—	Inside luggage compartment in the left rear quarter trim	*Left Side Luggage Compartment Components on page 11-401*	*E8S Rear Compartment Courtesy Lamp on page 11-545*
E13L	Headlamp – Left	—	On the left front corner of the vehicle located inside left headlamp assembly	*Front of Vehicle on page 11-374*	• *E13L Headlamp - Left (EF7/Z49) on page 11-546* • *E13L Headlamp - Left (-EF7-Z49) on page 11-547*
E13LA	Headlamp Assembly - Left	—	On the outside of the vehicle, at the left front corner of the vehicle	*Front of Vehicle on page 11-374*	—
E13R	Headlamp – Right	—	On the right front corner of the vehicle located inside right headlamp assembly	*Front of Vehicle on page 11-374*	• *E13R Headlamp - Right (EF7/Z49) on page 11-548* • *E13R Headlamp - Right (-EF7-Z49) on page 11-549*
E13RA	Headlamp Assembly - Right	—	On the outside of the vehicle, at the right front corner of the vehicle	*Front of Vehicle on page 11-374*	—
E14B	Seat Heating Element – Driver Cushion	—	In the passenger compartment, inside the driver seat cushion	*Driver Seat Components on page 11-388*	*E14B Seat Heating Element - Driver Cushion on page 11-550*
E14D	Seat Heating Element – Passenger Cushion	—	In the passenger compartment, inside the front passenger seat cushion	*Passenger Seat Components on page 11-389*	*E14D Seat Heating Element - Passenger Cushion on page 11-551*
E17D	Outside Rearview Mirror Glass - Driver	DLS	On the outside of the driver door, part of the outside rearview mirror - driver, at front	—	—
E17P	Outside Rearview Mirror Glass - Passenger	DLS	On the outside of the passenger door, part of the outside rearview mirror - passenger, at front	—	—
E18	Rear Defogger Grid	—	Inside the passenger compartment, attached to the rear window	*Liftgate Components on page 11-403*	• *E18 Rear Defogger Grid X1 on page 11-552* • *E18 Rear Defogger Grid X2 on page 11-553*
E29LR	Fog Lamp – Left Rear	LHD	At the left rear corner of the vehicle	—	—
E29RR	Fog Lamp – Right Rear	RHD	At the right rear corner of the vehicle	—	—

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
E37A	Dome/Reading Lamps	—	In the passenger compartment, at the front center of the headliner	• *Headliner Components (-UE1) on page 11-391* • *Headliner Components (UE1) on page 11-392*	• *E37A Dome/ Reading Lamps (UE1) on page 11-554* • *E37A Dome/ Reading Lamps (-UE1) on page 11-555*
E42L	Tail Lamp Assembly – Left	—	At the left rear corner of the vehicle	—	—
E42R	Tail Lamp Assembly – Right	—	At the right rear corner of the vehicle	—	—
E54	Hybrid/EV Battery Pack Coolant Heater	—	Internal to Hybrid/EV Battery Pack mounted to the contactor assembly	*Underbody - Hybrid/ EV Battery Pack Components (2 of 3) on page 11-407*	—
F101	Passenger Instrument Panel Air Bag	—	In the passenger compartment, in the passenger side of the instrument panel	*Front of Instrument Panel Components on page 11-383*	• *F101 Passenger Instrument Panel Air Bag X1 on page 11-557* • *F101 Passenger Instrument Panel Air Bag X2 on page 11-558*
F103	Power Inverter Module Assembly Cable Cover	—	In the left side of the engine compartment, covering the power inverter module	*Front of Hybrid/EV Drive Unit on page 11-380*	*F103 Power Inverter Module Assembly Cable Cover on page 11-559*
F105L	Roof Rail Air Bag – Left	AYF/AW7	In the passenger compartment, on the left side of the roof	*Left Front of Passenger Compartment Components on page 11-393*	*F105L Roof Rail Air Bag - Left on page 11-560*
F105R	Roof Rail Air Bag – Right	AYF/AW7	In the passenger compartment, on the right side of the roof	*Right Front of Passenger Compartment Components on page 11-394*	*F105R Roof Rail Air Bag - Right on page 11-561*
F106LF	Seat Air Bag – Left Front	AYF/AW7	In the passenger compartment, in the left front seat back	*Driver Seat Components on page 11-388*	*F106LF Side Air Bag - Left Front on page 11-563*
F106LR	Side Air Bag - Left Rear	AYF/AW7	In the passenger compartment, on the left side of the rear seat back	*Rear Seat Components on page 11-390*	*F106LR Seat Air Bag - Left Rear on page 11-564*
F106RF	Seat Air Bag – Right Front	AYF/AW7	In the passenger compartment, in the right front seat back	*Passenger Seat Components on page 11-389*	*F106RF Seat Air Bag - Right Front on page 11-565*
F106RR	Side Air Bag - Right Rear	AYF/AW7	In the passenger compartment, on the right side of the rear seat back	*Rear Seat Components on page 11-390*	*F106RR Seat Air Bag Right - Rear on page 11-566*
F107	Steering Wheel Air Bag	—	In the passenger compartment, in the steering wheel	*Steering Wheel Components on page 11-387*	• *F107 Steering Wheel Air Bag X1 on page 11-567* • *F107 Steering Wheel Air Bag X2 on page 11-568*
F112D	Seat Belt Retractor Pretensioner – Driver	—	In the passenger compartment, at the bottom of the left B-pillar	*Left Front of Passenger Compartment Components on page 11-393*	*F112D Seat Belt Retractor Pretensioner - Driver on page 11-569*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
F112P	Seat Belt Retractor Pretensioner – Passenger	—	In the passenger compartment, at the bottom of the right B-pillar	*Right Front of Passenger Compartment Components on page 11-394*	*F112P Seat Belt Retractor Pretensioner - Passenger on page 11-570*
F113D	Seat Belt Anchor Pretensioner - Driver	—	In the passenger compartment, on the lower outside of the driver seat, mounted to the floor	*Left Front of Passenger Compartment Components on page 11-393*	*F113D Seat Belt Anchor Pretensioner - Driver on page 11-571*
F113P	Seat Belt Anchor Pretensioner - Passenger	—	In the passenger compartment, on the lower outside of the passenger seat, mounted to the floor	*Right Front of Passenger Compartment Components on page 11-394*	*F113P Seat Belt Anchor Pretensioner - Passenger on page 11-572*
F114D	Knee Air Bag - Driver	AYF	In the passenger compartment, at the bottom of the driver side of the instrument panel	*Front of Instrument Panel Components on page 11-383*	*F114D Knee Air Bag - Driver on page 11-573*
F114P	Knee Air Bag - Passenger	AYF	In the passenger compartment, at the bottom of the passenger side of the instrument panel	*Front of Instrument Panel Components on page 11-383*	*F114P Knee Air Bag - Passenger on page 11-574*
G1	A/C Compressor	—	In the engine compartment, at the bottom, front center of drive motor.	*Front of Hybrid/EV Drive Unit on page 11-380*	• *G1 A/C Compressor X1 on page 11-575* • *G1 A/C Compressor X2 on page 11-576*
G5	Transmission Fluid Pump - Auxilary	—	In the engine compartment, internal to the transmission assembly	—	—
G10	Cooling Fan Motor	—	In the engine compartment, attached to the radiator shroud	*Front of Engine Compartment on page 11-378*	*G10 Cooling Fan Motor on page 11-577*
G19	Rear Window Washer Pump	—	In the front of vehicle, behind front fascia in the right front corner, in the washer fluid reservoir	*Front of Vehicle Behind Fascia on page 11-375*	*G19 Rear Window Washer Pump on page 11-578*
G24	Windshield Washer Pump	—	In the front of vehicle, behind front fascia in the right front corner, in the washer fluid reservoir	*Front of Vehicle Behind Fascia on page 11-375*	*G24 Windshield Washer Pump on page 11-579*
G35	Hybrid/EV Electronics Coolant Pump	—	In the engine compartment, right front lower	*Back of Engine Compartment on page 11-379*	*G35 Hybrid/EV Electronics Coolant Pump on page 11-580*
G36	Auxiliary Heater Coolant Pump	—	At the right side of the engine compartment, mounted to the suspension cradle	*Left Side Engine Compartment on page 11-376*	*G36 Auxiliary Heater Coolant Pump on page 11-581*
G37	Hybrid/EV Battery Pack Coolant Pump	—	At the front of the engine compartment, mounted to the center of the lower radiator support	*Back of Engine Compartment on page 11-379*	*G37 Hybrid/EV Battery Pack Coolant Pump on page 11-582*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
K1	14V Power Module	—	In the engine compartment on top of drive motor and under the power inverter module	*Front of Hybrid/EV Drive Unit on page 11-380*	• *K1 14V Power Module X1 on page 11-583* • *K1 14V Power Module X2 on page 11-584* • *K1 14V Power Module X4 on page 11-586* • *K1 14V Power Module X3 on page 11-585*
K6	Transmission Fluid Pump Control Module – Auxiliary	—	In the left side of the engine compartment, part of the power inverter module assembly	—	—
K8	Blower Motor Control Module	—	In the passenger compartment, under the passenger side of the instrument panel, mounted to the HVAC module assembly	*HVAC Assembly Components on page 11-384*	• *K8 Blower Motor Control Module X1 on page 11-587* • *K8 Blower Motor Control Module X2 on page 11-588*
K9	Body Control Module	—	In the passenger compartment, instrument panel	*Left Front of Passenger Compartment Components on page 11-393*	• *K9 Body Control Module X1 on page 11-589* • *K9 Body Control Module X2 on page 11-591* • *K9 Body Control Module X3 on page 11-593* • *K9 Body Control Module X4 on page 11-595* • *K9 Body Control Module X5 on page 11-597* • *K9 Body Control Module X6 on page 11-599* • *K9 Body Control Module X7 on page 11-601*
K10	Coolant Heater Control Module	—	At the center rear of the engine compartment, mounted to the bulkhead	*Rear of Hybrid/EV Drive Unit on page 11-381*	• *K10 Coolant Heater Control Module X1 on page 11-602* • *K10 Coolant Heater Control Module X2 on page 11-602*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
K16	Battery Energy Control Module	—	Underbody Integrated to the Hybrid/EV Battery Pack.	*Underbody - Hybrid/ EV Battery Pack Components (2 of 3) on page 11-407*	• *K16 Battery Energy Control Module X3 on page 11-603* • *K16 Battery Energy Control Module X6 on page 11-604* • *K16 Battery Energy Control Module X7 on page 11-606* • *K16 Battery Energy Control Module X8 on page 11-606* • *K16 Battery Energy Control Module X9 on page 11-607* • *K16 Battery Energy Control Module X10 on page 11-609* • *K16 Battery Energy Control Module X11 on page 11-610* • *K16 Battery Energy Control Module X12 on page 11-611*
K17	Electronic Brake Control Module	—	In the engine compartment, behind the right headlamp	*Left Side Engine Compartment on page 11-376*	*K17 Electronic Brake Control Module on page 11-613*
K20	Engine Control Module	—	In the engine compartment, Mounted on top of the on board charging module	*Front of Hybrid/EV Drive Unit on page 11-380*	• *K20 Engine Control Module X1 on page 11-614* • *K20 Engine Control Module X2 on page 11-616* • *K20 Engine Control Module X3 on page 11-617*
K33	HVAC Control Module	—	In the passenger compartment, in the center of the instrument panel, behind the HVAC controls	*HVAC Assembly Components on page 11-384*	• *K33 HVAC Control Module X1 on page 11-618* • *K33 HVAC Control Module X2 on page 11-619*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
K36	Inflatable Restraint Sensing and Diagnostic Module	—	In the passenger compartment, under the driver seat	*Left Front of Passenger Compartment Components on page 11-393*	• *K36 Inflatable Restraint Sensing and Diagnostic Module X1 on page 11-622* • *K36 Inflatable Restraint Sensing and Diagnostic Module X2 on page 11-624*
K41R	Rear Parking Assist Control Module	UD7	Mounted on top of left rear wheel well, behind tail lamp	*Left Rear Vehicle Components on page 11-405*	*K41R Rear Parking Assist Control Module (UD7) on page 11-626*
K43	Power Steering Control Module	—	In the passenger compartment, behind the instrument panel	*Steering Column Components on page 11-386*	• *K43 Power Steering Control Module X1 on page 11-627* • *K43 Power Steering Control Module X2 on page 11-628* • *K43 Power Steering Control Module X3 on page 11-629* • *K43 Power Steering Control Module X4 on page 11-630*
K57	Battery Charger Control Module	—	Underhood, Internal component of battery charger	—	—
K73	Telematics Communication Interface Control Module	UE1	In the passenger compartment, mounted under passenger seat	*Right Front of Passenger Compartment Components on page 11-394*	• *K73 Telematics Communication Interface Control Module X1 (UE1) on page 11-631* • *K73 Telematics Communication Interface Control Module X2 (UE1) on page 11-632*
K77	Remote Control Door Lock Receiver	—	In the passenger compartment, behind the center of the instrument panel	*Left Side Luggage Compartment Components on page 11-401*	*K77 Remote Control Door Lock Receiver on page 11-633*
K83	Parking Brake Control Module	—	Mounted under vehicle on right side, between the hybrid battery pack and rear bumper	*Underbody - Park Brake Components on page 11-409*	*K83 Parking Brake Control Module on page 11-634*
K84	Keyless Entry Control Module	—	In the luggage compartment on the right side behind quarter panel trim	*Right Side Luggage Compartment Components on page 11-402*	• *K84 Keyless Entry Control Module X1 on page 11-635* • *K84 Keyless Entry Control Module X2 on page 11-636*
K85	Passenger Presence Module	AYF	Under passenger seat mounted to seat frame	—	*K85 Passenger Presence Module (AYF) on page 11-637*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
K89	Immobilizer Control Module	—	In the passenger compartment, behind the instrument panel near the steering column	*Steering Column Components on page 11-386*	*K89 Immobilizer Control Module on page 11-638*
K107	Drive Motor Control Module	—	In the engine compartment, internal component of the power inverter module	—	—
K112	Hybrid/EV Battery Interface Control Module	—	Under vehicle inside hybrid/ev battery pack attached to battery section 1	*Underbody - Hybrid/EV Battery Pack Components (2 of 3) on page 11-407*	• *K112 Hybrid/EV Battery Interface Control Module X13 on page 11-639* • *K112 Hybrid/EV Battery Interface Control Module X14 on page 11-640* • *K112 Hybrid/EV Battery Interface Control Module X36 on page 11-641*
K114A	Hybrid/EV Powertrain Control Module 1	—	In the engine compartment internal component of the power inverter module.	—	—
K114B	Hybrid/EV Powertrain Control Module 2	—	In the passenger compartment, under the right front seat	*Left Front of Passenger Compartment Components on page 11-393*	• *K114B Hybrid/EV Powertrain Control Module 2 X1 on page 11-642* • *K114B Hybrid/EV Powertrain Control Module 2 X2 on page 11-645*
K132	Pedestrian Alert Sound Control Module	—	At the front of vehicle, left side, mounted to radiator core support below headlamp assembly - left	*Left Front of Passenger Compartment Components on page 11-393*	*K132 Pedestrian Alert Sound Control Module on page 11-657*
K159	Hybrid/EV Battery Pack Coolant Heater Module	—	Internal to the Hybrid/EV Battery Pack. Mounted to the contactor assembly.	—	• *K159 Hybrid/EV Battery Pack Coolant Heater Module X1 on page 11-662* • *K159 Hybrid/EV Battery Pack Coolant Heater Module X2 on page 11-663* • *K159 Hybrid/EV Battery Pack Coolant Heater Module X3 on page 11-664* • *K159 Hybrid/EV Battery Pack Coolant Heater Module X4 on page 11-665*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
KR34B	Hybrid/EV Battery Positive Contactor	—	Internal component to Hybrid/EV battery pack.	—	• *KR34B Hybrid/EV Battery Positive Contactor X2 on page 11-620* • *KR34B Hybrid/EV Battery Positive Contactor X3 on page 11-621*
KR116A	Battery Charging System Negative Contactor	—	Internal to the Hybrid/EV Battery Pack. Mounted to the contactor assembly.	—	• *KR116A Battery Charging System Negative Contactor X1 on page 11-647* • *KR116A Battery Charging System Negative Contactor X2 on page 11-648* • *KR116A Battery Charging System Negative Contactor X5 on page 11-649* • *KR116A Battery Charging System Negative Contactor X6 on page 11-650*
KR116B	Battery Charging System Positive Contactor	—	Internal to the Hybrid/EV Battery Pack. Mounted to the contactor assembly.	—	• *KR116B Battery Charging System Positive Contactor X1 on page 11-651* • *KR116B Battery Charging System Positive Contactor X2 on page 11-652*
KR117	Hybrid/EV Battery Multifunction Contactor	—	Internal to the Hybrid/EV Battery Pack. Mounted to the contactor assembly.	—	• *KR117 Hybrid/EV Battery Multifunction Contactor X1 on page 11-653* • *KR117 Hybrid/EV Battery Multifunction Contactor X2 on page 11-654* • *KR117 Hybrid/EV Battery Multifunction Contactor X5 on page 11-655* • *KR117 Hybrid/EV Battery Multifunction Contactor X6 on page 11-656*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
KR134	Pre-Charge Contactor	—	Internal to the Hybrid/EV Battery Pack. Mounted to the contactor assembly.	—	• *KR134 Pre -Charge Contactor X1 on page 11-658* • *KR134 Pre -Charge Contactor X2 on page 11-659* • *KR134 Pre -Charge Contactor X5 on page 11-660* • *KR134 Pre -Charge Contactor X6 on page 11-661*
M6	Air Temperature Door Actuator	—	In the passenger compartment, behind the center of the instrument panel	—	*M6 Air Temperature Door Actuator on page 11-666*
M7	Transmission Shift Lock Control Solenoid Actuator	—	In the passenger compartment, part of the automatic transmission shift lever assembly	—	—
M8	Blower Motor	—	In the passenger compartment, behind the passenger side of the instrument panel	*HVAC Assembly Components on page 11-384*	*M8 Blower Motor on page 11-668*
M14	Door Lock Actuator - Liftgate	—	Inside the bottom of liftgate left of center	*Liftgate Components on page 11-403*	*M14B Door Lock Actuator - Liftgate on page 11-669*
M14B	Door Lock Actuator – Liftgate	—	In the passenger compartment, inside the liftgate	*Liftgate Components on page 11-403*	*M14B Door Lock Actuator - Liftgate on page 11-669*
M15	Drive Motor	—	In the engine compartment	*Front of Hybrid/EV Drive Unit on page 11-380*	*M15 Drive Motor on page 11-670*
M37	Mode Door Actuator	—	In the passenger compartment, left front, within the instrument panel, mounted to left of HVAC assembly	*HVAC Assembly Components on page 11-384*	*M37 Mode Door Actuator on page 11-671*
M38	Power Steering Motor	—	In passenger compartment mounted to steering column.	—	—
M45	Rear Wiper Motor	—	In the vehicle interior, inside the liftgate	*Liftgate Components on page 11-403*	*M45 Rear Wiper Motor on page 11-672*
M46	Air Recirculation Door Actuator	—	In the passenger compartment, left front, within the instrument panel, mounted to right of HVAC assembly	—	*M46 Air Recirculation Door Motor on page 11-673*
M74D	Window Motor – Driver	—	In the passenger compartment, inside the driver door	*Driver Door Components on page 11-395*	*M74D Window Motor - Driver on page 11-674*
M74LR	Window Motor – Left Rear	—	In the passenger compartment, inside the left rear door	*Left Rear Door Components on page 11-398*	*M74LR Window Motor - Left Rear on page 11-675*
M74P	Window Motor – Passenger	—	In the passenger compartment, inside the passenger door	*Passenger Door Components on page 11-397*	*M74P Window Motor - Passenger on page 11-676*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
M74RR	Window Motor – Right Rear	—	In the passenger compartment, inside the right rear door	*Right Rear Door Components on page 11-400*	*M74RR Window Motor - Right Rear on page 11-677*
M75	Windshield Wiper Motor	—	In the cowl panel, at the base of the windshield	*Left Side Engine Compartment on page 11-376*	*M75 Windshield Wiper Motor on page 11-678*
M77D	Outside Rearview Mirror Motor – Driver	—	In the passenger compartment, behind the driver door panel	—	*M77D Outside Rearview Mirror Motor - Driver on page 11-679*
M77P	Window Motor – Passenger	—	In the passenger compartment, behind the passenger door panel	—	*M77P Outside Rearview Mirror Motor - Passenger on page 11-680*
M93	Key Capture Solenoid Actuator	–BTM	In the passenger compartment, left front, mounted to the bottom of the steering column, mounted to ignition lock cylinder housing, at bottom	—	*M93 Key Capture Solenoid Actuator (-BTM) on page 11-681*
M96	Active Grille Air Shutter Actuator	—	At front of vehicle, at center, rear of lower center grille opening	*Front of Vehicle on page 11-374*	*M96 Active Grille Air Shutter Actuator on page 11-682*
M110	Hybrid/EV Battery Charger Receptacle Lock Actuator	—	At the left front of the vehicle, behind the charging port door, part of Hybrid/EV Battery Charger Receptacle	—	—
P2	Transmission Shift Lever Position Indicator	—	In the passenger compartment, on the center console, next to the automatic transmission shift lever	—	—
P9	Driver Information Center Display	—	In the passenger compartment, part of the instrument cluster assembly	—	—
P12	Horn	—	In the engine compartment, near the left front corner of the vehicle	*Front of Vehicle Behind Fascia on page 11-375*	*P12 Horn on page 11-683*
P16	Instrument Cluster	—	In the passenger compartment, in the driver side of the instrument panel	*Front of Instrument Panel Components on page 11-383*	*P16 Instrument Cluster on page 11-684*
P17	Info Display Module	—	In the passenger compartment, in the Center of the instrument panel, above radio	*Front of Instrument Panel Components on page 11-383*	*P17 Info Display Module on page 11-685*
P19J	Speaker – Left Instrument Panel	—	In the passenger compartment, on the left side of the instrument panel	*Front of Instrument Panel Components on page 11-383*	*P19J Speaker - Left Instrument Panel on page 11-686*
P19L	Speaker Left Rear Compartment	—	In the passenger compartment, in the left rear compartment trim panel, near the strut tower	*Left Side Luggage Compartment Components on page 11-401*	*P19L Speaker - Left Rear Compartment on page 11-687*
P19W	Speaker Right Instrument Panel	—	In the passenger compartment, on the right side of the instrument panel	*Front of Instrument Panel Components on page 11-383*	*P19W Speaker - Right Instrument Panel on page 11-688*
P19Y	Speaker Right Rear Compartment	—	In the passenger compartment, in the right rear compartment trim panel, near the strut tower	*Right Side Luggage Compartment Components on page 11-402*	*P19Y Speaker - Right Rear Compartment on page 11-689*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
P28	Speaker - Parking Assist	UD7	In the passenger compartment, in the left rear compartment trim panel under left tail lamp	*Left Rear Vehicle Components on page 11-405*	*P28 Speaker - Parking Assist (UD7) on page 11-690*
P36	Battery State of Charge Indicator	—	In the passenger compartment in upper center of instrument panel.	*Front of Instrument Panel Components on page 11-383*	*P36 Battery State of Charge Indicator on page 11-691*
P48	Pedestrian Alert Sound Speaker	—	Front of vehicle left side behind fascia. below headlamp — left	*Front of Vehicle Behind Fascia on page 11-375*	*P48 Pedestrian Alert Sound Speaker on page 11-692*
Q5	Brake Pressure Modulator	—	At the rear of the engine compartment, driver side, mounted to the electronic brake control module	—	—
Q65	Hybrid/EV Battery Pack Coolant Control Valve	—	In the rear of the engine compartment, near the right strut tower, mounted to the bulkhead	*Front of Hybrid/EV Drive Unit on page 11-380*	*Q65 Hybrid/EV Battery Pack Coolant Control Valve on page 11-693*
R25	Hybrid/EV Battery Pre− Charge Resistor	—	Inside hybrid/ev battery pack.	—	• *R25 Hybrid/EV Battery Pre −Charge Resistor X1 on page 11-694* • *R25 Hybrid/EV Battery Pre −Charge Resistor X2 on page 11-695*
R35	Manual Service Disconnect Resistor	—	Inside hybrid/ev battery pack.	*Underbody - Hybrid/EV Battery Pack Components (2 of 3) on page 11-407*	*R35 Manual Service Disconnect Resistor on page 11-696*
S3	Transmission Shift Lever	—	In the passenger compartment, in the center console	*Center Console Components on page 11-382*	*S3 Transmission Shift Lever on page 11-697*
S13D	Door Lock Switch – Driver	—	In the passenger compartment, inside the driver door	*Driver Door Components on page 11-395*	*S13D Door Lock Switch - Driver (AU3) on page 11-698*
S13P	Door Lock Switch – Driver	—	In the passenger compartment, inside the passenger door	*Passenger Door Components on page 11-397*	*S13P Door Lock Switch - Passenger (AU3) on page 11-699*
S15	Hybrid Battery Pack High Voltage Manual Disconnect Lever	—	In the passenger compartment under rear seat lower cushion	*Right Side Luggage Compartment Components on page 11-402*	—
S16	Driver Information Center Switch	—	In the passenger compartment on the instrument panel left of steering column	*Front of Instrument Panel Components on page 11-383*	*S16 Driver Information Center Switch on page 11-700*
S26	Hazard Warning Switch	—	In the passenger compartment, in the center of the instrument panel	*Front of Instrument Panel Components on page 11-383*	*S26 Hazard Warning Switch on page 11-701*
S32D	Seat Heating Switch – Driver	—	In the passenger compartment, at the front of the center console	*Front of Instrument Panel Components on page 11-383*	*S32D Seat Heating Switch - Driver on page 11-702*
S32P	Seat Heating Switch – Passenger	—	In the passenger compartment, at the front of the center console	*Front of Instrument Panel Components on page 11-383*	*S32P Seat Heating Switch - Passenger on page 11-703*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
S33	Horn Switch	—	In the passenger compartment, within the steering wheel, forward of the air bag.	*Steering Wheel Components on page 11-387*	*S33 Horn Switch on page 11-704*
S39	Ignition Switch	-BTM	In the passenger compartment, on the steering column	*Steering Column Components on page 11-386*	*S39 Ignition Switch (-BTM) on page 11-705*
S40	Passenger Air Bag Disable Switch	C99	In the passenger compartment, on the instrument panel	—	*S40 Passenger Air Bag Disable Switch on page 11-706*
S46B	Liftgate Unlatch Switch	—	In the passenger compartment, on the instrument panel left of steering column	*Front of Instrument Panel Components on page 11-383*	*S46B Liftgate Unlatch Switch (Without AU3) on page 11-707*
S48E	Multifunction Switch - Center Console	—	In the passenger compartment, in the center console below shift lever	*Center Console Components on page 11-382*	*S48E Multifunction Switch - Center Console on page 11-708*
S51	Telematics Button Assembly	UE1	In the passenger compartment, front center, within the overhead console, at front left	*Headliner Components (UE1) on page 11-392*	*S51 Telematics Button Assembly on page 11-709*
S52	Outside Rearview Mirror Switch	—	In the passenger compartment, on the driver side of the instrument panel	*Front of Instrument Panel Components on page 11-383*	*S52 Outside Rearview Mirror Switch on page 11-710*
S70L	Steering Wheel Controls Switch - Left	K34	In the passenger compartment, left front, on steering wheel, left spoke facing driver	*Steering Wheel Components on page 11-387*	*S70L Steering Wheel Controls Switch - Left (K34) on page 11-711*
S70R	Steering Wheel Controls Switch - Right	—	In the passenger compartment, left front, on steering wheel, right spoke facing driver	*Steering Wheel Components on page 11-387*	*S70R Steering Wheel Controls Switch - Right on page 11-712*
S78	Turn Signal/Multifunction Switch	—	In the passenger compartment, on the steering column	*Steering Column Components on page 11-386*	*S78 Turn Signal Multifunction Switch on page 11-714*
S79D	Window Switch – Driver	—	In the passenger compartment, in the driver door	*Driver Door Components on page 11-395*	*S79D Window Switch - Driver on page 11-715*
S79LR	Window Switch – Left Rear	—	In the passenger compartment, in the left rear door	*Left Rear Door Components on page 11-398*	*S79LR Window Switch - Left Rear on page 11-716*
S79P	Window Switch – Passenger	—	In the passenger compartment, in the passenger door	*Passenger Door Components on page 11-397*	*S79P Window Switch - Passenger on page 11-717*
S79RR	Window Switch – Right Rear	—	In the passenger compartment, in the right rear door	*Right Rear Door Components on page 11-400*	*S79RR Window Switch - Right Rear on page 11-718*
S82	Windshield Wiper/Washer Switch	—	In the passenger compartment, left front, within the steering column, forward of the steering wheel, on right side	*Steering Column Components on page 11-386*	*S82 Windshield Wiper/Washer Switch on page 11-719*
S83	Vehicle On/Off Switch	BTM	In the passenger compartment, in the center of the instrument panel left of HVAC controls	*Steering Column Components on page 11-386*	*S83 Vehicle On/Off Switch (BTM) on page 11-720*
S91	Park Brake Control Switch	—	In the passenger compartment, in the center console below shift lever	*Center Console Components on page 11-382*	*S91 Park Brake Control Switch on page 11-721*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
S94	Blower Motor Switch	—	In the passenger compartment, in the center of the instrument panel part of HVAC controls	*Front of Instrument Panel Components on page 11-383*	—
S126	Drive Mode Select Switch	—	In the passenger compartment, in the center console below Park Brake Switch, right side	*Front of Instrument Panel Components on page 11-383*	*S126 Drive Mode Select Switch on page 11-722*
T6	Power Inverter Module	—	In the engine compartment, under the power inverter module assembly cable cover	*Front of Hybrid/EV Drive Unit on page 11-380*	• *T6 Power Inverter Module X1 on page 11-723* • *T6 Power Inverter Module X2 on page 11-725* • *T6 Power Inverter Module X3 on page 11-726* • *T6 Power Inverter Module X4 on page 11-727* • *T6 Power Inverter Module X5 on page 11-728* • *T6 Power Inverter Module X6 on page 11-729* • *T6 Power Inverter Module X7 on page 11-730* • *T6 Power Inverter Module X8 on page 11-731*
T4D	Cellular Phone and Digital Radio Antenna	—	Outside the vehicle, at the center rear of the roof	—	—
T4M	Radio Antenna	—	Outside the vehicle, at the center rear of the roof	*Front of Vehicle on page 11-374*	—
T10J	Keyless Entry Antenna - Center Console Front	BTM	Inside the passenger compartment, mounted to the front of shift lever	*Center Console Components on page 11-382*	*T10J Keyless Entry Antenna - Center Console Front on page 11-732*
T10K	Keyless Entry Antenna - Center Console Rear	BTM	Inside the passenger compartment, mounted to the rear of shift lever	*Right Side Luggage Compartment Components on page 11-402*	*T10K Keyless Entry Antenna - Center Console Rear on page 11-733*
T12	Automatic Transmission Assembly	—	In the engine compartment, mounted to the left side of the drive motor	—	—

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
T18	Battery Charger	—	*In the engine compartment mounted above transmission assembly and below engine control module*	*Front of Hybrid/EV Drive Unit on page 11-380*	• *T18 Battery Charger X1 on page 11-734* • *T18 Battery Charger X2 on page 11-735* • *T18 Battery Charger X3 on page 11-736* • *T18 Battery Charger X4 on page 11-737* • *T18 Battery Charger X5 on page 11-738* • *T18 Battery Charger X6 on page 11-739*
T24	Battery Charger – DC	—	In the engine compartment mounted above the power inverter module	*Front of Hybrid/EV Drive Unit on page 11-380*	• *T24 Battery Charger - DC X1 on page 11-740* • *T24 Battery Charger - DC X2 (CBT) on page 11-741* • *T24 Battery Charger - DC X3 on page 11-742* • *T24 Battery Charger - DC X4 on page 11-743* • *T24 Battery Charger - DC X5 on page 11-744* • *T24 Battery Charger - DC X6 on page 11-745* • *T24 Battery Charger - DC X7 on page 11-746* • *T24 Battery Charger - DC X8 on page 11-747* • *T24 Battery Charger - DC X9 on page 11-748*
X21	Manual Service Disconnect Receptacle	—	Under the vehicle at the top of the Hybrid/EV battery, under the battery cover at the top rear of section 2	*Underbody - Hybrid/EV Battery Pack Components (2 of 3) on page 11-407*	• *X21 Manual Service Disconnect Receptacle X3 on page 11-749* • *X21 Manual Service Disconnect Receptacle X5 on page 11-750*
X50A	Fuse Block – Underhood	—	In the engine compartment, in the left rear corner of the engine compartment	*Left Side Engine Compartment on page 11-376*	*Electrical Center Identification Views on page 11-430*
X50D	Fuse Block – Underhood Auxiliary	—	In the engine compartment, on the left side of the engine compartment	*Left Side Engine Compartment on page 11-376*	*Electrical Center Identification Views on page 11-430*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
X51A	Fuse Block – Instrument Panel	—	In the passenger compartment, on the driver side of the instrument panel	*Rear of Instrument Panel Components on page 11-385*	*Electrical Center Identification Views on page 11-430*
X55AH	Fuse Holder – Hybrid/EV Battery Pack Coolant Heater Module	—	Internal to Hybrid/EV Battery Pack in the high voltage wiring harness	—	*Electrical Center Identification Views on page 11-430*
X55W	Fuse Holder – Hybrid/EV Battery Pack Coolant Heater	—	Internal to Hybrid/EV Battery Pack in the high voltage wiring harness	—	*Electrical Center Identification Views on page 11-430*
X80G	Accessory Power Receptacle	—	In the passenger compartment, center front, behind compartment door, below HVAC controls	*Front of Instrument Panel Components on page 11-383*	*X80G Accessory Power Receptacle - Instrument Panel on page 11-751*
X80H	Accessory Power Receptacle - Center Console	—	In the passenger compartment, center middle, at rear center console, near bottom	*Center Console Components on page 11-382*	*X80H Accessory Power Receptacle - Center Console on page 11-752*
X83	Auxiliary Audio Input	—	In the passenger compartment, center middle, Instrument panel under HVAC control head	*Front of Instrument Panel Components on page 11-383*	*X83 Auxiliary Audio Input on page 11-753*
X84	Data Link Connector	—	In the passenger compartment, on the driver side of the instrument panel	*Rear of Instrument Panel Components on page 11-385*	*X84 Data Link Connector on page 11-754*
X84A	Auxiliary Data Link Connector	—	In the passenger compartment, near the right side of the center stack on the lower instrument panel.	*Rear of Instrument Panel Components on page 11-385*	*X84A Auxillary Data Link Connector on page 11-755*
X85	Steering Wheel Air Bag Coil	—	In the passenger compartment, behind the steering wheel, on the steering column	*Steering Column Components on page 11-386*	• *X85 Steering Wheel Air Bag Coil X1 on page 11-756* • *X85 Steering Wheel Air Bag Coil X2 on page 11-757*
X98	Hybrid/EV Battery Charger Receptacle	—	At the left front of the vehicle, behind the charging port door	—	*X98 Hybrid/EV Battery Charger Receptacle on page 11-758*
X98A	Hybrid/EV Battery Charger Receptacle – AC	—	At the left front of the vehicle, behind the charging port door, part of Hybrid/EV Battery Charger Receptacle	—	*X98A Hybrid/EV Battery Charger Receptacle - AC on page 11-759*
X98D	Hybrid/EV Battery Charger Receptacle – DC	CBT	At the left front of the vehicle, behind the charging port door, part of Hybrid/EV Battery Charger Receptacle	—	—
X100	Body Harness to Engine Harness (8 Cavities)	—	In the engine compartment, left rear, near battery	*Left Side Engine Compartment Harness Routing on page 11-256*	*X100 Body Harness to Engine Harness on page 11-761*
X105	Body Harness to Engine Harness (36 Cavities)	—	In the engine compartment, left rear, near battery	*Left Side Engine Compartment Harness Routing on page 11-256*	*X105 Body Harness to Engine Harness on page 11-762*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
X106	Body Harness to Forward Lamp Harness (36 Cavities)	—	In the engine compartment, right rear, near top of right strut tower	*Right Side Engine Compartment Harness Routing on page 11-257*	*X106 Body Harness to Forward Lamp Harness on page 11-766*
X110	Forward Lamp Harness to Left Headlight Assembly (4 Cavities)	—	At the front of vehicle, at the bottom of headlamp assembly – left	*Left Front of Engine Compartment Harness Routing on page 11-258*	*X110 Forward Lamp Harness to Left Headlight Assembly on page 11-769*
X115	Body Harness to Engine Harness (36 Cavities)	—	In the engine compartment, right rear, near right side of strut tower	*Right Side Engine Compartment Harness Routing on page 11-257*	*X115 Body Harness to Engine Harness on page 11-770*
X116	Engine Harness to Forward Lamp Harness (16 Cavities)	—	At the front of vehicle, at the bottom of headlamp assembly – left	*Left Front of Engine Compartment Harness Routing on page 11-258*	*X116 Engine Harness to Forward Lamp Harness on page 11-774*
X117	Engine Harness to Forward Lamp Harness (12 Cavities)	—	At the front of vehicle, at the bottom of headlamp assembly – left	*Left Front of Engine Compartment Harness Routing on page 11-258*	*X117 Engine Harness to Forward Lamp Harness on page 11-776*
X120	Forward Lamp Harness to Right Headlight Assembly (4 Cavities)	—	At the front of vehicle, at the bottom of headlamp assembly – Right	—	*X120 Forward Lamp Harness to Right Headlight Assembly on page 11-777*
X175	Engine Harness to Transmission Harness	—	In the engine compartment, on the front of the transmission assembly	—	*X175 Engine Harness to Transmission Harness on page 11-778*
X200	Instrument Panel Harness to Body Harness (58 Cavities)	—	In the passenger compartment, at the base of the left A-pillar, behind the kick panel	*Instrument Panel Harness Routing on page 11-266*	*X200 Instrument Panel Harness to Body Harness on page 11-780*
X210	Instrument Panel Harness to Body Harness (22 Cavities)	—	In the passenger compartment, behind the left side of the instrument panel	*Instrument Panel Harness Routing on page 11-266*	*X210 Instrument Panel Harness to Body Harness on page 11-785*
X215	Body Harness to Instrument Panel Harness (1 Cavity)	—	In the passenger compartment, at the base of the left A-pillar, above the kick panel	*Instrument Panel Harness Routing on page 11-266*	*X215 Body Harness to Instrument Panel Harness on page 11-787*
X235	Instrument Panel Harness to Inflatable Restraint Module Jumper (4 Cavities)	—	In the passenger compartment, behind the right side of the instrument panel, above the glove box	*Instrument Panel Harness Routing on page 11-266*	*X235 Instrument Panel Harness to Inflatable Restraint Module Jumper on page 11-788*
X236	Instrument Panel Harness to Air Duct Jumper (2 Cavities)	—	In the passenger compartment, behind the right side of the instrument panel	—	*X236 Instrument Panel Harness to Air Duct Jumper on page 11-789*
X310	Body Harness to Instrument Panel Harness (22 Cavities)	—	In the passenger compartment, under the center console	*Instrument Panel Harness Routing on page 11-266*	*X310 Body Harness to Instrument Panel Harness on page 11-790*
X351	Auxiliary Battery Cable Harness to High Voltage Interlock Loop Harness (2 Cavities)	—	Underbody in rear of vehicle, connected to front of Hybrid/EV battery pack	—	*X351 Auxiliary Battery Cable Harness to High Voltage Interlock Loop Harness on page 11-792*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
X352	Auxiliary Battery Cable Harness to High Voltage Interlock Loop Harness (2 Cavities)	—	Underbody in rear of vehicle, connected to front of Hybrid/EV battery pack	—	*X352 Auxiliary Battery Cable Harness to High Voltage Interlock Loop Harness on page 11-793*
X357	Body Harness to Battery Harness (16 Cavities)	—	Underbody in rear of vehicle, connected to front of Hybrid/EV battery pack	—	*X357 Body Harness to Battery Harness on page 11-794*
X358	Body Harness to Battery Harness (16 Cavities)	—	Underbody in rear of vehicle, connected to left side of Hybrid/EV battery pack	—	*X358 Body Harness to Battery Harness on page 11-796*
X359	Low Voltage Haness to Low Voltage Harness	—	Underbody in rear of vehicle, internal Hybrid/EV battery pack	—	*X359 Auxiliary Battery Cable Harness to Low Voltage Harness on page 11-798*
X405	Body Extension Harness to Body Harness (3 Cavities)	—	Underbody in rear of vehicle between bumper and main body	*Rear Body Extension Harness Routing (UD7) on page 11-264*	*X405 Body Extension Harness to Body Harness on page 11-800*
X410	Body Harness to Left Rear Lamp Harness (8 Cavities)	—	In the luggage compartment, near the left tail lamp, behind the trim panel	*Left Rear of Passenger Compartment Harness Routing on page 11-269*	*X410 Body Harness to Left Rear Lamp Harness on page 11-801*
X420	Body Harness to Left Rear Lamp Harness (8 Cavities)	—	In the luggage compartment, near the right tail lamp, behind the trim panel	*Right Rear of Passenger Compartment Harness Routing on page 11-271*	*X420 Body Harness to Right Rear Lamp Harness on page 11-802*
X450	Body Jumper Harness to Rear Bumper Harness (4 Cavities)	UD7	—	*Rear Fascia Harness Routing (UD7) on page 11-265*	*X450 Body Jumper Harness to Rear Bumper Harness on page 11-803*
X500	Body Harness to Driver Door Harness (30 Cavities)	—	In the passenger compartment, at the left front A-pillar	*Driver Door Harness Routing on page 11-252*	*X500 Body Harness to Driver Door Harness on page 11-804*
X600	Body Harness to Passenger Door Harness (30 Cavities)	—	In the passenger compartment, at the right front A-pillar	*Passenger Door Harness Routing on page 11-253*	*X600 Passenger Door Harness to Body Harness on page 11-807*
X700	Left Rear Door Harness to Body Harness (11 Cavities)	—	In the passenger compartment, in the left B-pillar	*Left Rear Door Harness Routing on page 11-254*	*X700 Left Rear Door Harness to Body Harness on page 11-809*
X800	Right Rear Door Harness to Body Harness (11 Cavities)	—	In the passenger compartment, in the right B-pillar	*Right Rear Door Harness Routing on page 11-255*	*X800 Right Rear Door Harness to Body Harness on page 11-811*
X900	Liftgate Harness to Body Harness	—	In the cargo area, on the left side, behind the trim panel	*Liftgate Harness Routing on page 11-272*	*X900 Liftgate Harness to Body Harness on page 11-813*
X902	Liftgate Extension Harness to Liftgate Harness	—	In the rear of the vehicle, behind the liftgate trim panel, below the middle of the rear window	*Liftgate Harness Routing on page 11-272*	*X902 Liftgate Extention Harness to Liftgate Harness on page 11-815*

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
X905	Body Harness to Tailgate Harness	UVC	In the rear of the vehicle, behind the liftgate trim panel, below the middle of the rear window above the license plate lights	*Liftgate Harness Routing on page 11-272*	*X905 Body Harness to Tailgate Harness (UVC) on page 11-816*
G100	Battery Negative Harness	—	In the engine compartment, front left of center, on frame rail forward of battery	*G100 on page 11-411*	—
G101	Forward Lamp Harness	—	In the engine compartment, front left of center, on core support under Left headlamp assembly.	*G101 and G102 on page 11-412*	—
G102	Forward Lamp Harness	—	In the engine compartment, front right of center, on core support under right headlamp assembly.	*G101 and G102 on page 11-412*	—
G103	Engine Harness	—	In the engine compartment, rear center, on frame.	*G103, G105 and G106 on page 11-413*	—
G104	Engine Harness	—	In the engine compartment, front right of center, on frame.	*G104, G110 and G112 on page 11-414*	—
G105	Engine Harness	—	In the engine compartment, rear of front frame right of center.	*G103, G105 and G106 on page 11-413*	—
G106	Engine Harness	—	In the engine compartment, rear left of center, on frame.	*G103, G105 and G106 on page 11-413*	—
G110	Engine Harness	—	In the engine compartment, attached to left of center front of frame	*G104, G110 and G112 on page 11-414*	—
G112	Engine Harness	—	In the engine compartment, attached to left side of coolant heater control module	*G104, G110 and G112 on page 11-414*	—
G151	Ground Jumper Harness	—	In the engine compartment, attached to right side front of rear frame	*G151 and G152 on page 11-415*	—
G152	Ground Jumper Harness	—	In the engine compartment, attached to right side or drive motor	*G151 and G152 on page 11-415*	—
G153	Ground Jumper Harness	—	In the engine compartment, mounted to front center of frame	*G153 and G154 on page 11-416*	—
G154	Ground Jumper Harness	—	In the engine compartment, mounted to left front corner of power inverter module	*G153 and G154 on page 11-416*	—
G155	Ground Harness	—	In the engine compartment, mounted to left and rear of rear frame	*G155 on page 11-417*	—
G160	Ground Harness	—	In the engine compartment, mounted left of center on front of frame	*G160 and G161 on page 11-418*	—
G201	Body Harness	—	In the passenger compartment, left front, at base of left A-pillar	*G201 on page 11-419*	—
G202	Body Harness	—	In the passenger compartment, right front, at base of left A-pillar	*G202 on page 11-420*	—

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
G210	Instrument Panel Harness	—	In the passenger compartment, behind instrument cluster above steering column on left side tie bar support bracket	*G210 on page 11-421*	—
G211	Instrument Panel Harness	—	In the passenger compartment, behind right of glove box, mounted to instrument panel support bracket	*G211 on page 11-422*	—
G213	Instrument Panel Harness	—	In the passenger compartment, behind instrument cluster above steering column on right side of tie bar support bracket	*G213 on page 11-423*	—
G214	Instrument Panel Harness	—	In the passenger compartment, right of center forward of middle, on floor below center console near G215	*G214, G215 and G305 on page 11-424*	—
G215	Instrument Panel Harness	—	In the passenger compartment, right of center forward of middle, on floor below center console near G214	*G214, G215 and G305 on page 11-424*	—
G259	Body Harness	—	outside under body left of center mounted in tunnel	*G259, G354, G355, G356, G357 and G358 on page 11-425*	—
G303	Body Harness	—	In the passenger compartment, right of center rear of middle, on floor below center console near accessory power outlet break out	*G303 on page 11-427*	—
G305	Body Harness	—	In the passenger compartment, right of center rear of middle, on floor below left front seat.	*G214, G215 and G305 on page 11-424*	—
G310	Body Harness	—	At the left rear of the luggage compartment	*G310 on page 11-428*	—
G311	Body Harness	—	At the right rear of the luggage compartment	*G311 on page 11-429*	—
G350	Hybrid/EV Battery Pack Low Voltage Harness	—	Inside battery pack right of contactor assembly forward of battery sections	—	—
G354	Body Harness	—	outside under body left of center mounted on body bracket	*G259, G354, G355, G356, G357 and G358 on page 11-425*	—
G355	Ground Jumper	—	outside under body left of center mounted on body frame rail next to G358	*G259, G354, G355, G356, G357 and G358 on page 11-425*	—
G356	Ground Jumper	—	outside under body left of center mounted to battery pack next to G357	*G259, G354, G355, G356, G357 and G358 on page 11-425*	—
G357	Ground Jumper	—	outside under body left of center mounted to battery pack next to G356	*G259, G354, G355, G356, G357 and G358 on page 11-425*	—
G358	Ground Jumper	—	outside under body left of center mounted on body frame rail next to G355	*G259, G354, G355, G356, G357 and G358 on page 11-425*	—

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
J101	Body Harness	—	In the body harness approximately 4.5 cm (1.77 in) from the windshield wiper motor	*Left Side Engine Compartment Harness Routing on page 11-256*	—
J102	Engine Harness	—	In the engine harness approximately 4.5 cm (1.77 in) from the Battery Charger – DC X6 breakout	*Front of Drive Motor Harness Routing View on page 11-259*	—
J103	Engine Harness	—	In the engine harness approximately 7.5 cm (2.95 in) from the Power Inverter Module X2 breakout	*Front of Drive Motor Harness Routing View on page 11-259*	—
J104	Engine Harness	—	In the engine harness approximately 5 cm (1.96 in) from the Power Inverter Module X1	*Front of Drive Motor Harness Routing View on page 11-259*	—
J105	Engine Harness	—	In the engine harness approximately 11 cm (4.33 in) from the Power Inverter Module branch breakout	*Front of Drive Motor Harness Routing View on page 11-259*	—
J106	Engine Harness	—	In the engine harness approximately 5.5 cm (2.16 in) from the G110 branch breakout	*Front of Drive Motor Harness Routing View on page 11-259*	—
J107	Engine Harness	—	In the engine harness main bundle approximately 4.5 cm (1.77 in) from the G109 branch breakout	*Front of Drive Motor Harness Routing View on page 11-259*	—
J108	Forward Lamp Harness	—	In the forward lamp harness approximately 3 cm (1.18 in) from the X116 breakout	*Left Front of Engine Compartment Harness Routing on page 11-258*	—
J109	Forward Lamp Harness	—	In the forward lamp harness approximately 3 cm (1.18 in) from the G101 breakout	*Left Front of Engine Compartment Harness Routing on page 11-258*	—
J110	Forward Lamp Harness	—	In the forward lamp harness approximately 7 cm (2.75 in) from the main harness breakout	*Right Side Engine Compartment Harness Routing on page 11-257*	—
J111	Forward Lamp Harness	—	In the forward lamp harness approximately 5 cm (1.97 in) from the washer hose breakout	*Right Side Engine Compartment Harness Routing on page 11-257*	—
J112	Forward Lamp Harness	—	In the forward lamp harness approximately 7 cm (2.77 in) from the washer hose breakout	*Right Side Engine Compartment Harness Routing on page 11-257*	—
J113	Forward Lamp Harness	—	In the forward lamp harness approximately 6 cm (2.37 in) from the rear window washer pump	*Right Side Engine Compartment Harness Routing on page 11-257*	—
J200	Body Harness	—	In the body harness approximately 5.5 cm (2.17 in) from the X200 branch breakout	*Left Front of Passenger Compartment Harness Routing on page 11-268*	—
J201	Body Harness	—	In the body harness approximately 2.5 cm (1 in) on the X200 branch	*Left Front of Passenger Compartment Harness Routing on page 11-268*	—

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
J202	Body Harness	—	In the body harness approximately 5 cm (1.98 in) from G201 branch breakout	*Left Front of Passenger Compartment Harness Routing on page 11-268*	—
J206	Instrument Panel Harness	—	In the instrument Panel harness approximately 20 cm (7.87 in) from the data link connector	*Instrument Panel Harness Routing on page 11-266*	—
J207	Instrument Panel Harness	—	In the instrument Panel harness approximately 24.5 cm (9.64 in) from the data link connector	*Instrument Panel Harness Routing on page 11-266*	—
J208	Instrument Panel Harness	—	In the instrument Panel harness, inside X200 branch approximately 7 cm (2.75 in) from X200	*Instrument Panel Harness Routing on page 11-266*	—
J209	Instrument Panel Harness	—	In the instrument Panel harness, inside body control module branch approximately 4.5 cm (1.77 in) body control module X3	*Instrument Panel Harness Routing on page 11-266*	—
J210	Instrument Panel Harness	—	In the instrument Panel harness, inside main bundle approximately 3 cm (1.18 in) of G210 breakout	*Instrument Panel Harness Routing on page 11-266*	—
J211	Instrument Panel Harness	—	In the instrument Panel harness, inside main bundle approximately 2.5 cm (1 in) of G210 breakout	*Instrument Panel Harness Routing on page 11-266*	—
J212	Instrument Panel Harness	—	In the instrument Panel harness, inside main bundle approximately 6.5 cm (2.55 in) of G210 breakout	*Instrument Panel Harness Routing on page 11-266*	—
J213	Instrument Panel Harness	—	In the instrument Panel harness, inside main bundle approximately 15 cm (5.90 in) of G210 breakout	*Instrument Panel Harness Routing on page 11-266*	—
J214	Instrument Panel Harness	—	In the instrument Panel harness, inside main bundle approximately 4.5 cm (1.77 in) of G213 breakout	*Instrument Panel Harness Routing on page 11-266*	—
J215	Instrument Panel Harness	—	In the instrument Panel harness, inside instrument cluster branch approximately 18 cm (7.08 in) from breakout	*Instrument Panel Harness Routing on page 11-266*	—
J216	Instrument Panel Harness	—	In the instrument Panel harness near center inside main bundle approximately 3.5 cm (1.37 in) from HVAC controls and Vehicle On Off Switch breakout	*Instrument Panel Harness Routing on page 11-266*	—
J217	Instrument Panel Harness	—	In the instrument Panel harness, in the Info Display Module branch approximately 6 cm (2.36 in) from breakout	*Instrument Panel Harness Routing on page 11-266*	—

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
J218	Instrument Panel Harness	—	In the instrument Panel harness near center inside main bundle approximately 2.5 cm (1 in) from the Info Display Module branch breakout	*Instrument Panel Harness Routing on page 11-266*	—
J219	Instrument Panel Harness	—	In the instrument Panel harness near center inside main bundle approximately 10.5 cm (4.13 in) from the Info Display Module branch breakout	*Instrument Panel Harness Routing on page 11-266*	—
J220	Instrument Panel Harness	—	In the instrument Panel harness, in the Radio branch approximately 7cm (2.75 in) from main bundle breakout	*Instrument Panel Harness Routing on page 11-266*	—
J222	Instrument Panel Harness	—	In the instrument Panel harness, behind center stack in the Radio branch approximately 17 cm (6.69 in) from main bundle breakout	*Instrument Panel Harness Routing on page 11-266*	—
J223	Instrument Panel Harness	—	In the instrument Panel harness, behind center stack in the Auxiliary Audio Input branch approximately 2 cm (.75 in) from breakout	*Instrument Panel Harness Routing on page 11-266*	—
J225	Instrument Panel Harness	—	In the instrument Panel harness near center inside main bundle approximately 7 cm (2.75 in) from the Hazard Warning Switch branch breakout	*Instrument Panel Harness Routing on page 11-266*	—
J226	Instrument Panel Harness	—	In the instrument Panel harness near center inside main bundle approximately 8 cm (3.14 in) from the Radio X4 breakout	*Instrument Panel Harness Routing on page 11-266*	—
J227	Instrument Panel Harness	—	In the instrument Panel harness approximately 2 cm (3.14 in) from G215 breakout	*Instrument Panel Harness Routing on page 11-266*	—
J228	Instrument Panel Harness	—	In the instrument Panel harness approximately 1 cm (.4 in) from G214 breakout	*Instrument Panel Harness Routing on page 11-266*	—
J229	Instrument Panel Harness	—	In the instrument Panel harness approximately 17 cm (6.69 in) from the Auxiliary Data Connector	*Instrument Panel Harness Routing on page 11-266*	—
J230	Instrument Panel Harness	—	In the instrument Panel harness approximately 13 cm (5.11 in) from the Auxiliary Data Connector	*Instrument Panel Harness Routing on page 11-266*	—
J231	Instrument Panel Harness	—	In the instrument Panel harness approximately 9 cm (3.54 in) from the Auxiliary Data Connector	*Instrument Panel Harness Routing on page 11-266*	—
J232	Instrument Panel Harness	—	In the instrument Panel harness approximately 5 cm (1.97 in) from the Auxiliary Data Connector	*Instrument Panel Harness Routing on page 11-266*	—

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
J233	Instrument Panel Harness	—	In the instrument Panel harness approximately 13 cm (5.11 in) from the Pedestrian Alert Sound Control Module branch breakout	*Driver Door Harness Routing on page 11-252*	—
J235	Body Harness	—	In the body harness approximately 15 cm (4.13 in) forward of plastic harness channel	*Instrument Panel Harness Routing on page 11-266*	—
J302	Body Harness	—	In the body harness approximately 23 cm (9.05 in) forward of plastic harness channel	*Instrument Panel Harness Routing on page 11-266*	—
J303	Body Harness	—	In the body harness approximately 15 cm (5.90 in) forward of plastic harness channel	*Instrument Panel Harness Routing on page 11-266*	—
J304	Body Harness	—	In the body harness approximately 7.5 cm (2.95 in) forward of plastic harness channel	*Instrument Panel Harness Routing on page 11-266*	—
J305	Body Harness	—	In the body harness approximately 31 cm (12.20 in) forward of B pillar breakout	*Right Front of Passenger Compartment Harness Routing on page 11-270*	—
J306	Body Harness	—	In the body harness approximately 19 cm (7.48 in) forward of B pillar breakout	*Right Front of Passenger Compartment Harness Routing on page 11-270*	—
J307	Body Harness	—	In the body harness approximately 90 cm (3.54 in) forward of B pillar breakout	*Right Front of Passenger Compartment Harness Routing on page 11-270*	—
J308	Body Harness	—	In the body harness inside branch for the Telematics Communication Interface Module. Approximately 5 cm (1.97 in) from main harness breakout	*Right Front of Passenger Compartment Harness Routing on page 11-270*	—
J309	Body Harness	—	In the body harness inside branch for X310, Approximately 5 cm (1.97 in) from x310	*Right Front of Passenger Compartment Harness Routing on page 11-270*	—
J310	Body Harness	—	In the body harness approximately 5.5 cm (2.16 in) from main harness breakout for the Telematics Communication Interface Module	*Right Front of Passenger Compartment Harness Routing on page 11-270*	—
J311	Body Harness	—	In the body harness approximately 13.5 cm (5.31 in) from main harness breakout for the Telematics Communication Interface Module	*Right Front of Passenger Compartment Harness Routing on page 11-270*	—

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
J312	Body Harness	—	In the body harness, under driver seat	*Left Rear of Passenger Compartment Harness Routing on page 11-269*	—
J313	Body Harness	—	In the body harness approximately 8 cm (3.14 in) from main harness breakout for the drivers seat	*Left Rear of Passenger Compartment Harness Routing on page 11-269*	—
J314	Body Harness	—	In the body harness approximately 17.5 cm (6.89 in) from main harness breakout body cross over to drivers seat	*Left Rear of Passenger Compartment Harness Routing on page 11-269*	—
J317	Body Harness	—	In the body harness approximately 9.5 cm (3.74 in) forward of seat belt pretensioner breakout	*Left Rear of Passenger Compartment Harness Routing on page 11-269*	—
J318	Body Harness	—	In the body harness approximately 8 cm (3.14 in) forward of seat side air bag – left rear	*Left Rear of Passenger Compartment Harness Routing on page 11-269*	—
J319	Body Harness	—	In the body harness approximately 11.5 cm (4.52 in) forward of seat side air bag – right rear	*Right Rear of Passenger Compartment Harness Routing on page 11-271*	—
J320	Body Harness	—	In the body harness approximately 16 cm (6.29 in) forward of drivers seat breakout	—	—
J351	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J352	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J353	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J354	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J355	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J356	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J357	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J358	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J359	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—

Master Electrical Component List (cont'd)

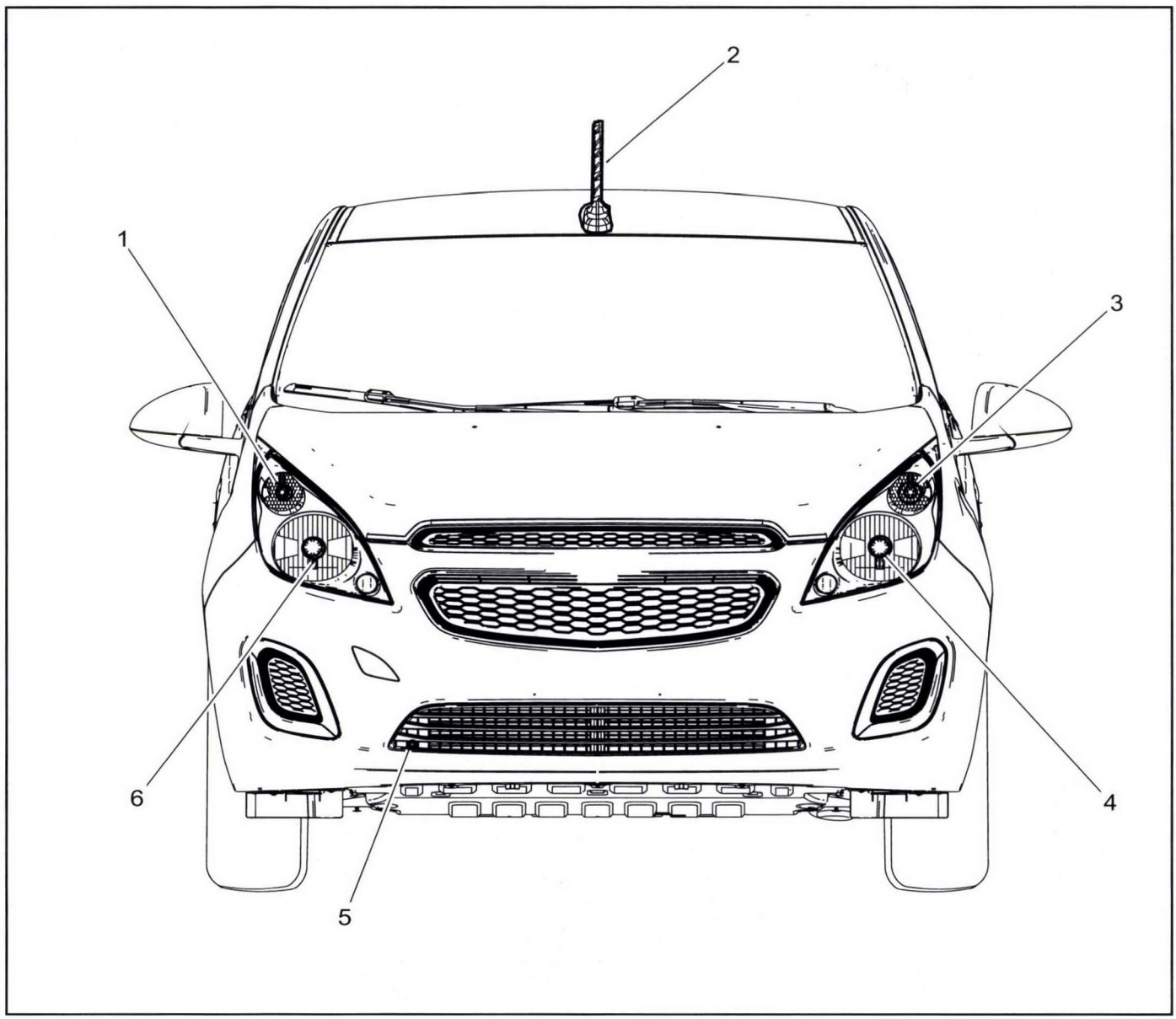
Code	Name	Option	Location	Locator View	Connector End View
J360	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J361	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J362	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J363	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J364	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J365	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J366	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J367	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J368	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J369	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J370	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J371	Hybrid/EV Battery Pack Low Voltage Harness	—	Internal to Hybrid/EV Battery Pack	—	—
J400	Body Harness	—	In the body harness approximately 5.5 cm (2.16 in) from X405 branch breakout	*Left Rear of Passenger Compartment Harness Routing on page 11-269*	—
J500	Driver Door Harness	—	Behind the driver door trim panel, approximately 4.5 cm (1.77 in) from the breakout to the Side Impact Sensor	*Driver Door Harness Routing on page 11-252*	—
J501	Driver Door Harness	—	Behind the driver door trim panel, approximately 7.5 cm (2.95 in) from the breakout to the Window Motor – Driver	*Driver Door Harness Routing on page 11-252*	—
J900	Liftgate Harness	—	In the liftgate harness approximately 3 cm (1.18 in) from the X905 breakout	*Liftgate Harness Routing on page 11-272*	—
J901	Liftgate Harness	UVC	In the liftgate harness approximately 3 cm (1.18 in) from the Rearview Camera	*Liftgate Harness Routing on page 11-272*	—

Master Electrical Component List (cont'd)

Code	Name	Option	Location	Locator View	Connector End View
J902	Liftgate Harness	—	In the liftgate harness approximately 14 cm (5.51 in) from the body to liftgate pass through	*Liftgate Harness Routing on page 11-272*	—
J903	Liftgate Harness	—	In the liftgate harness approximately 3 cm (1.18 in) from the Door Lock Actuator breakout	*Liftgate Harness Routing on page 11-272*	—

Front of Vehicle/Engine Compartment Component Views

Front of Vehicle



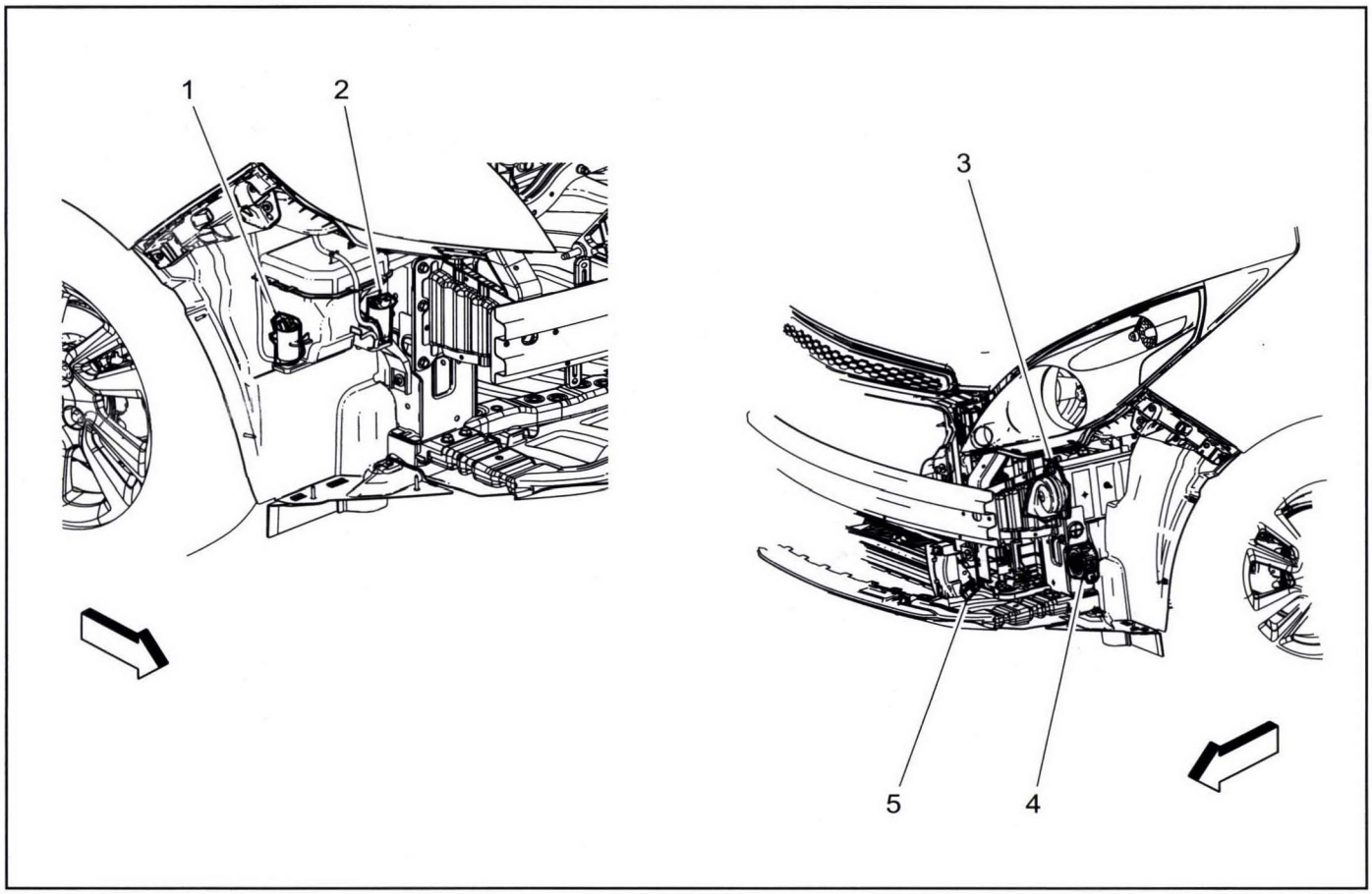
3216399

Items

(1) E4P Park/Turn Signal Lamp - Right
(2) T4M Radio Antenna
(3) E4N Park/Turn Signal Lamp - Left
(4) E13L Headlamp - Left

(5) B9 Ambient Air Temperature Sensor
(6) E13R Headlamp - Right

Front of Vehicle Behind Fascia

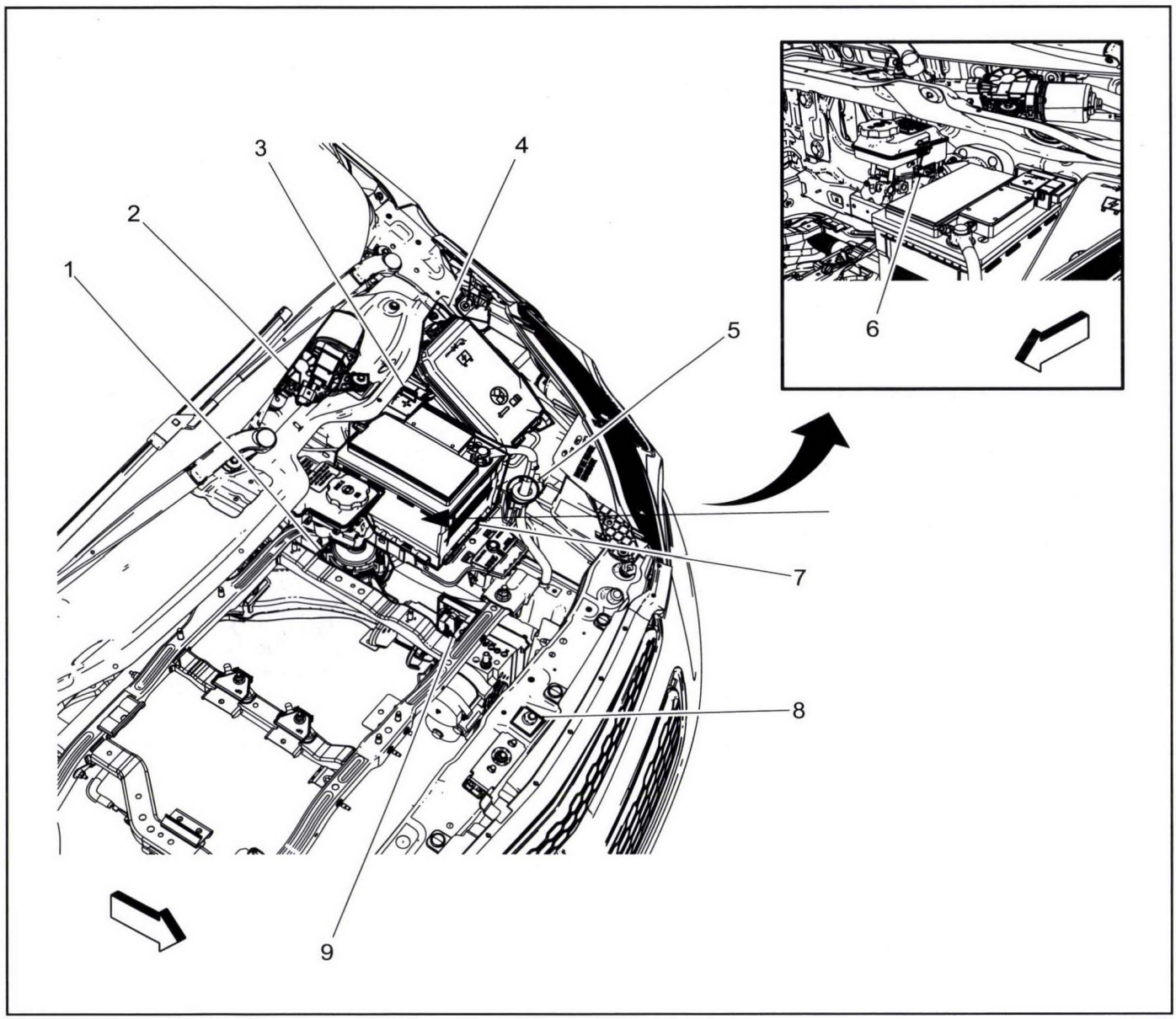


3216401

Items

(1) G24 Windshield Washer Pump
(2) G19 Rear Window Washer Pump
(3) P12 Horn
(4) P48 Pedestrian Alert Sound Speaker
(5) M96 Active Grille Air Shutter Actuator

Left Side Engine Compartment

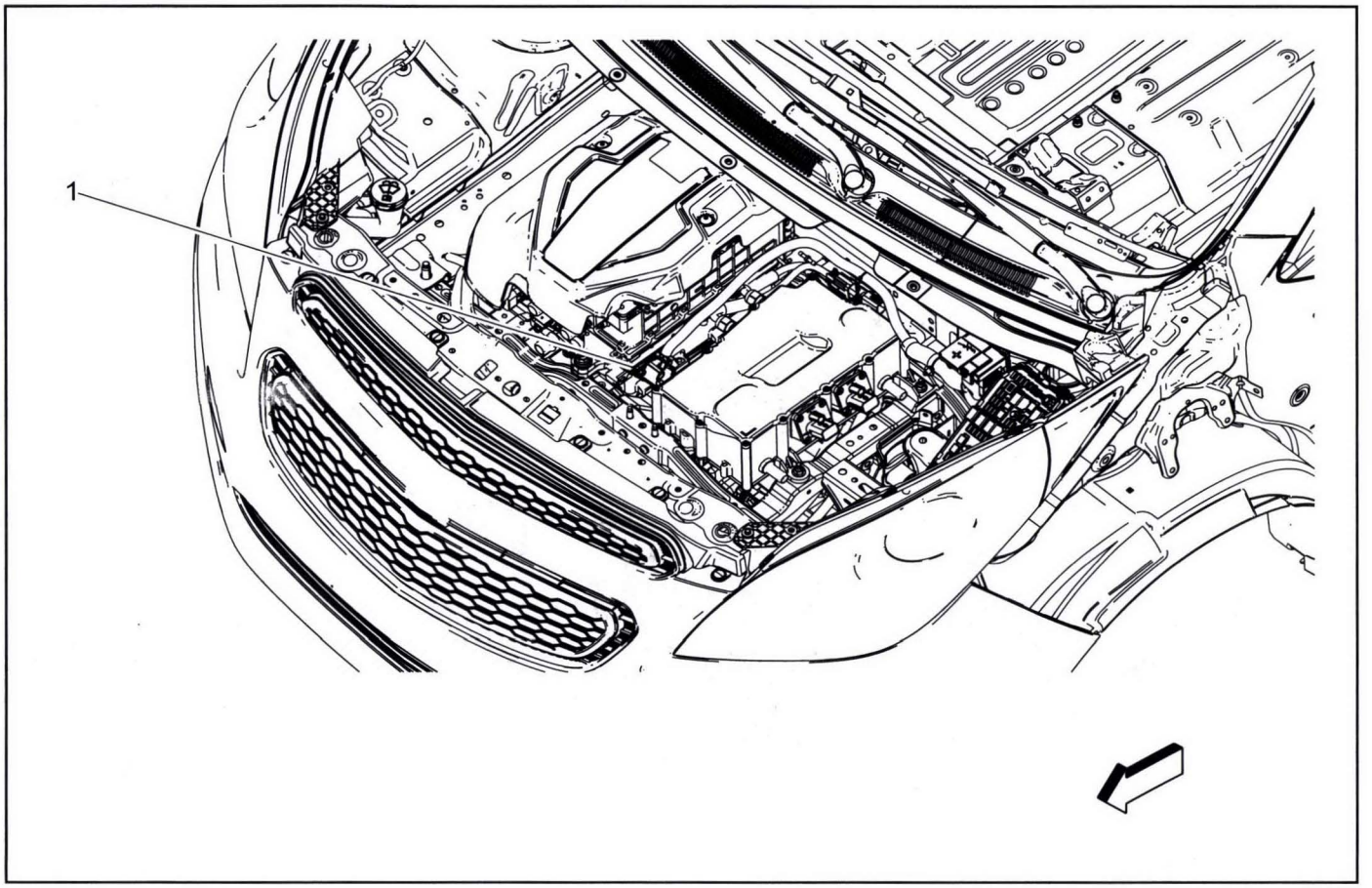


3216403

Items

(1) G36 Auxiliary Heater Coolant Pump
(2) M75 Windshield Wiper Motor
(3) X50D Fuse Block - Battery
(4) X50A Fuse Block - Underhood
(5) B1 A/C Refrigerant Pressure Sensor
(6) B20 Brake Fluid Level Switch
(7) C1 Battery
(8) B55 Hood Ajar Switch
(9) K17 Electronic Brake Control Module

Engine Compartment Top

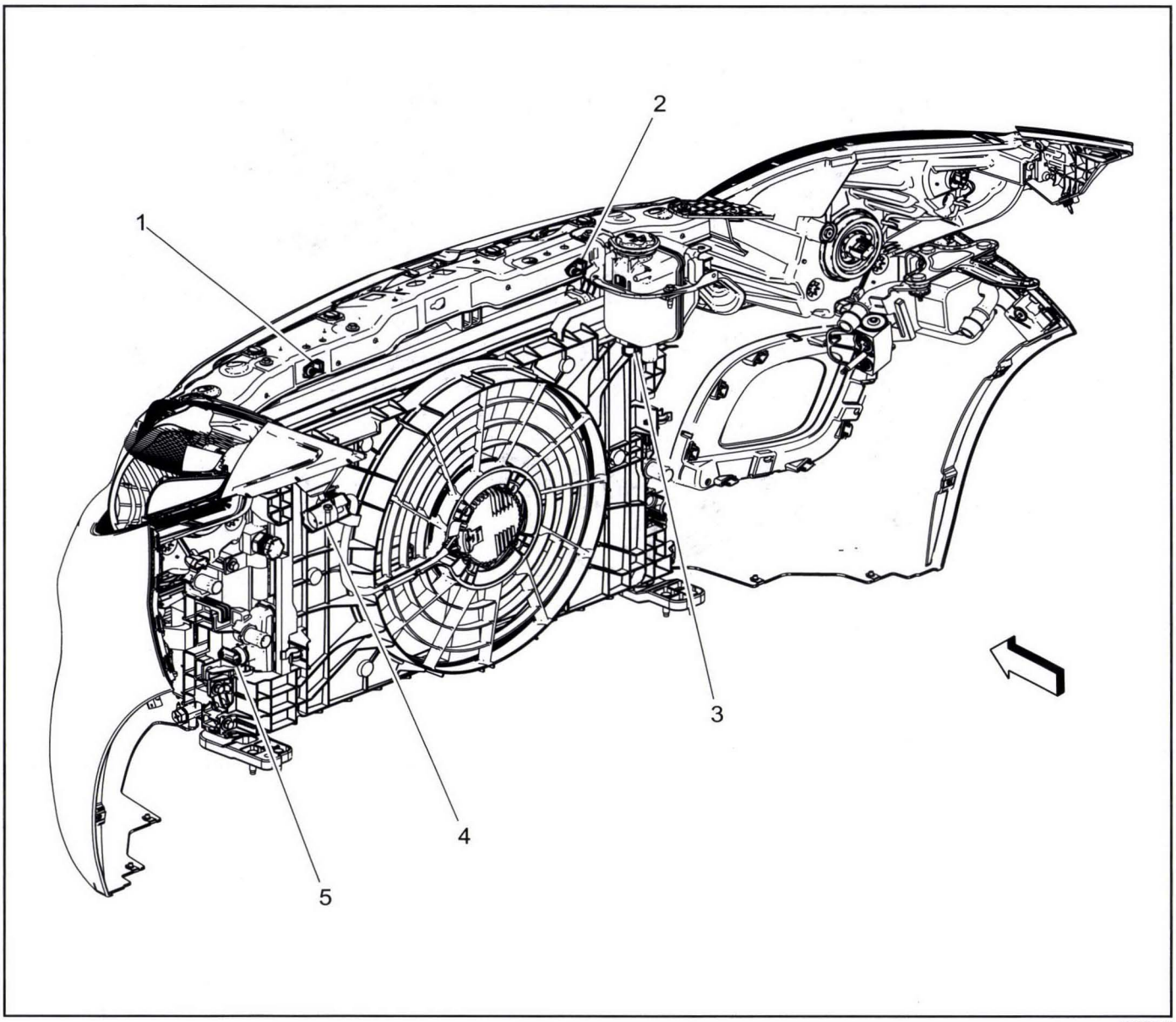


3216409

Items

(1) K1 14V Power Module

Front of Engine Compartment



3216411

Items

(1) B59L Front Impact Sensor - Left (D90/AYF/AW7)

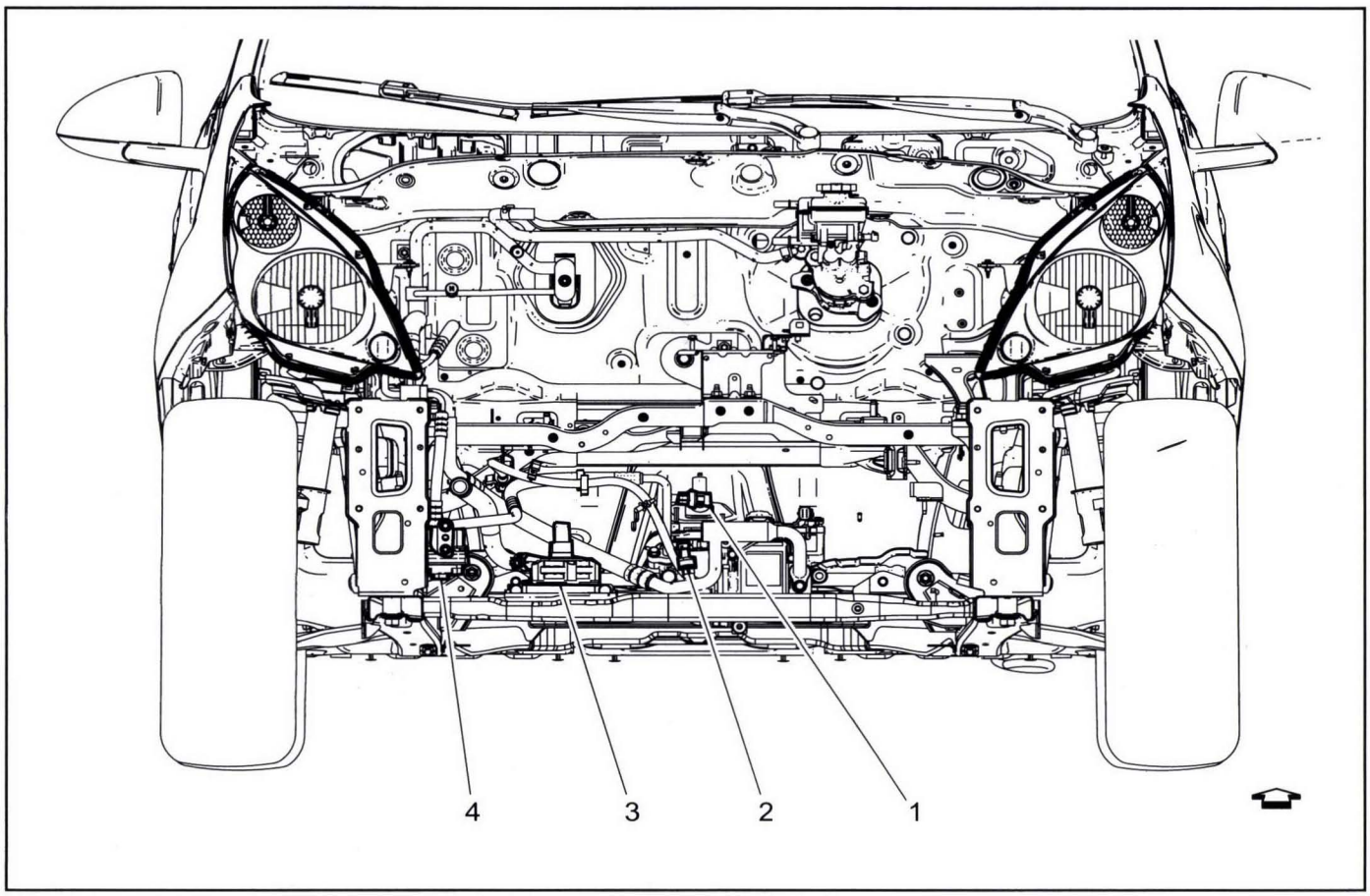
(2) B59R Front Impact Sensor - Right (D90/AYF/AW7)

(3) B258 Hybrid/EV Battery Coolant Level Switch

(4) G10 Cooling Fan Motor

(5) B202 Hybrid/EV Electronics Coolant Temperature Sensor

Back of Engine Compartment

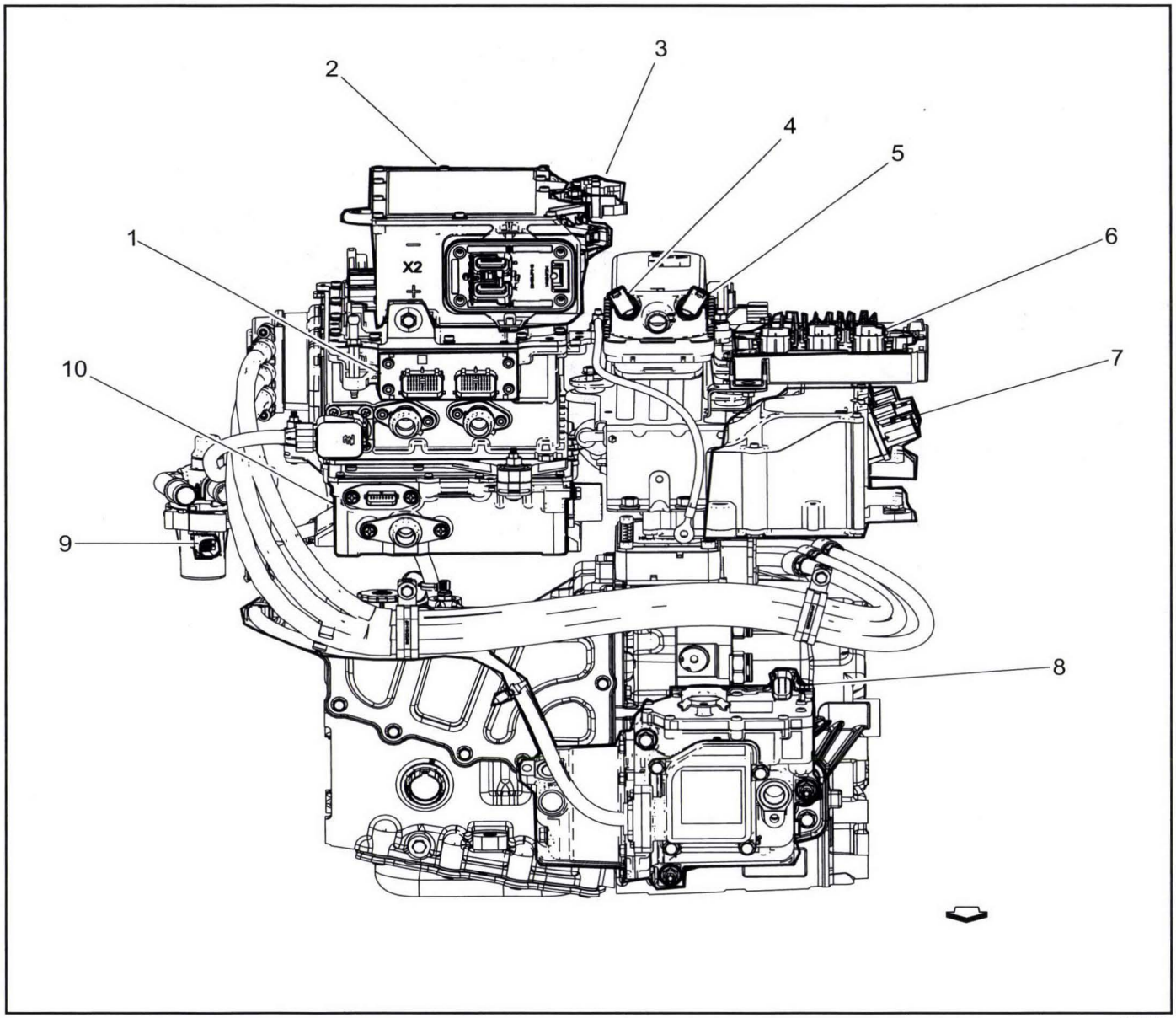


3216441

Items

(1) B1 A/C Refrigerant Pressure Sensor
(2) B1C A/C Low Side Pressure Sensor
(3) G35 Hybrid/EV Electronics Coolant Pump
(4) G37 Hybrid/EV Battery Pack Coolant Pump

Powertrain Component Views
Front of Hybrid/EV Drive Unit

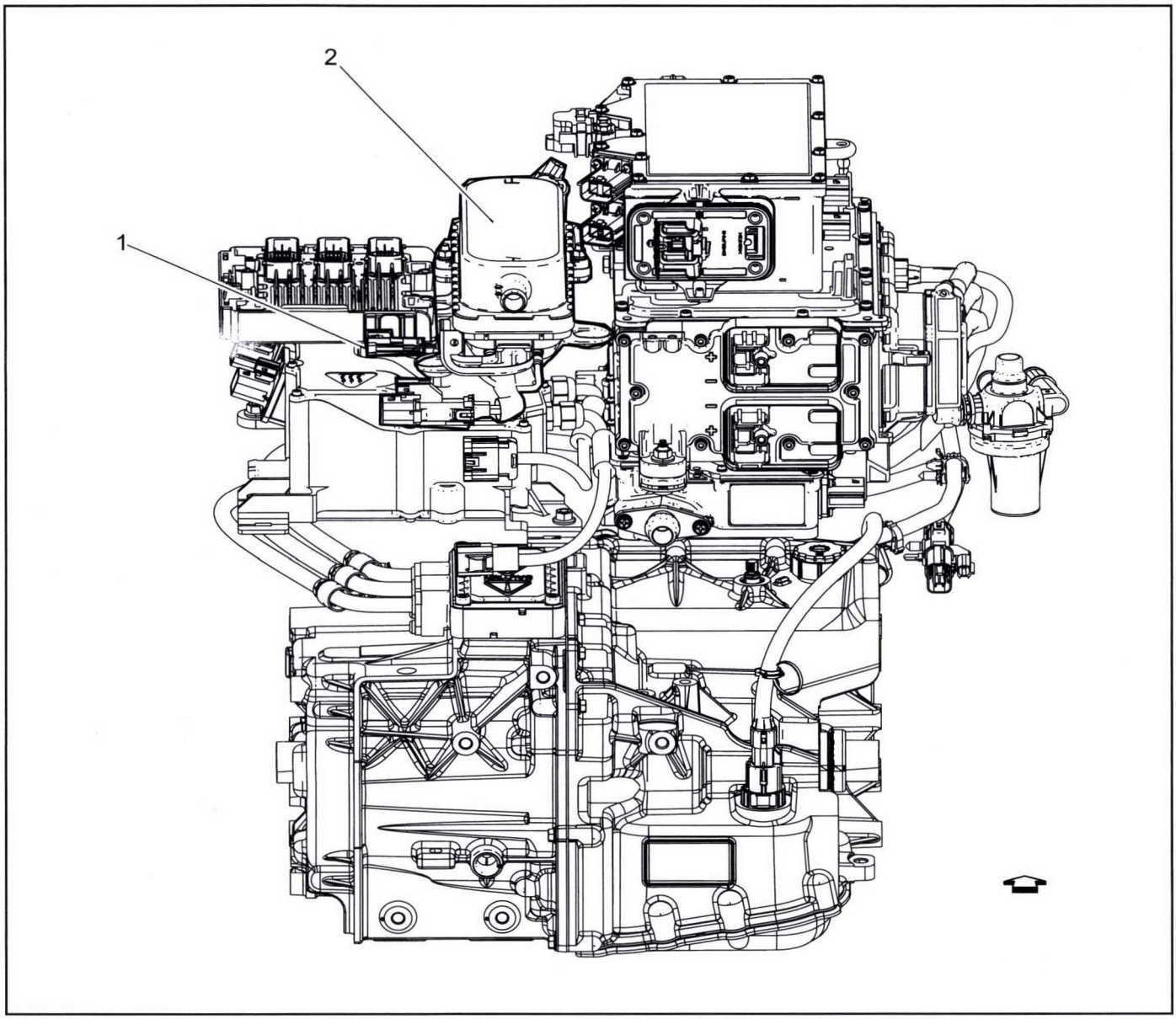


3216413

Items

(1) T6 Power Inverter Module
(2) T24 Battery Charger - DC
(3) F103 Power Inverter Module Assembly Cable Cover
(4) B135 Coolant Heater Temperature Sensor
(5) K10 Coolant Heater Control Module
(6) K20 Engine Control Module
(7) T18 Battery Charger
(8) G1 A/C Compressor
(9) Q65 Hybrid/EV Battery Pack Coolant Control Valve
(10) K1 14V Power Module

Rear of Hybrid/EV Drive Unit



3216415

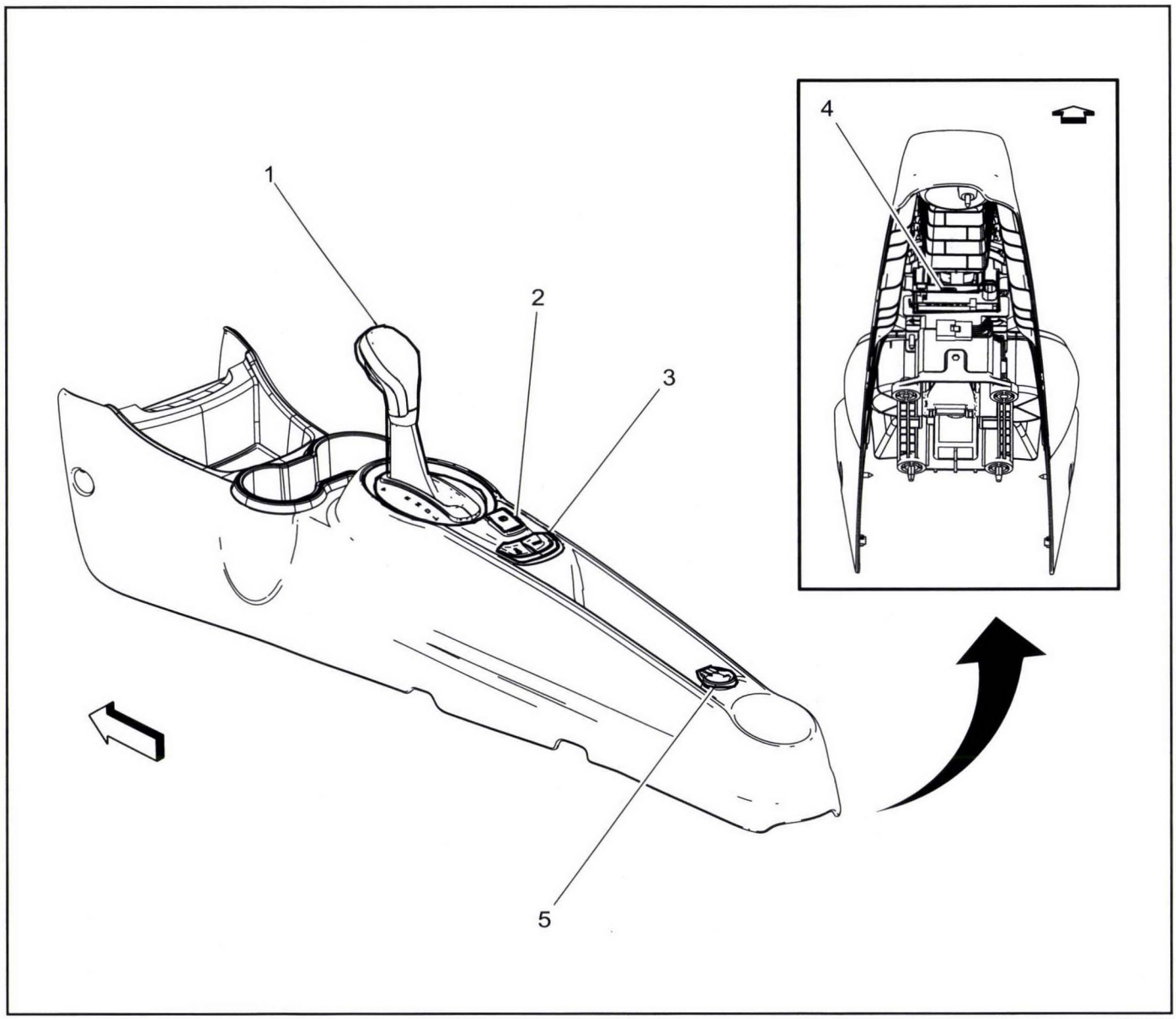
Items

(1) K10 Coolant Heater Control Module

(2) G36 Auxiliary Heater Coolant Pump

Instrument Panel/Center Console Component Views

Center Console Components



3216350

Items

(1) S3 Transmission Shift Lever

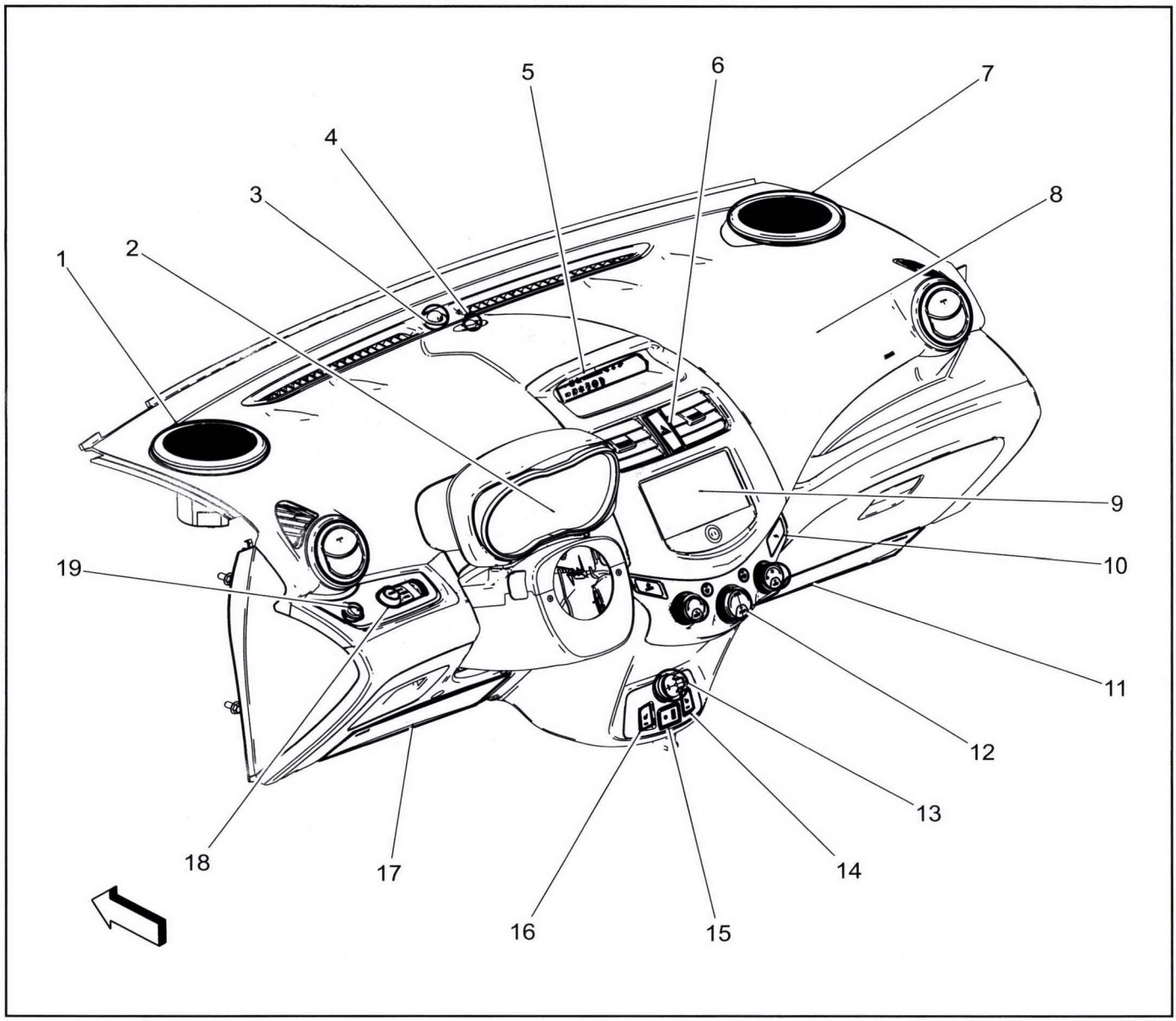
(2) S91 Park Brake Control Switch

(3) S48E Multifunction Switch - Center Console

(4) T10J Keyless Entry Antenna - Center Console Front (BTM)

(5) X80H Accessory Power Receptacle - Center Console

Front of Instrument Panel Components

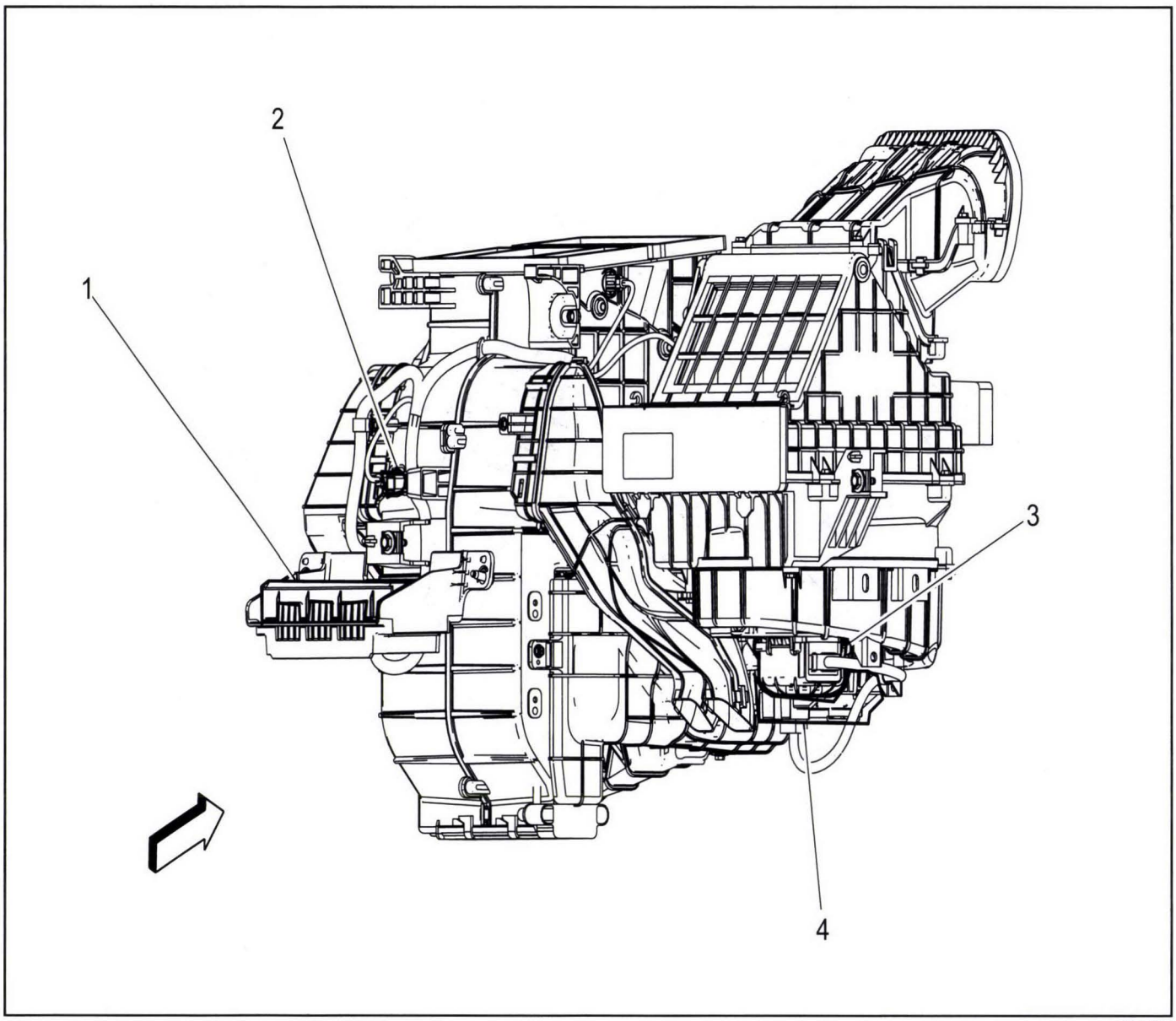


3216349

Items

(1) P19J Speaker - Left Instrument Panel
(2) P16 Instrument Cluster
(3) B10B Ambient Light/Sunload Sensor
(4) P36 Battery State of Charge Indicator
(5) P17 Info Display Module
(6) S26 Hazard Warning Switch
(7) P19W Speaker - Right Instrument Panel
(8) F101 Passenger Instrument Panel Air Bag
(9) A11 Radio
(10) S126 Drive Mode Select Switch
(11) F114P Knee Air Bag - Passenger (AYF)
(12) A26 HVAC Controls
(13) X80G Accessory Power Receptacle - Instrument Panel
(14) S32P Seat Heating Switch - Passenger
(15) X83 Auxiliary Audio Input
(16) S32D Seat Heating Switch - Driver
(17) F114D Knee Air Bag - Driver (AYF)
(18) S16 Driver Information Center Switch
(19) S52 Outside Rearview Mirror Switch

HVAC Assembly Components

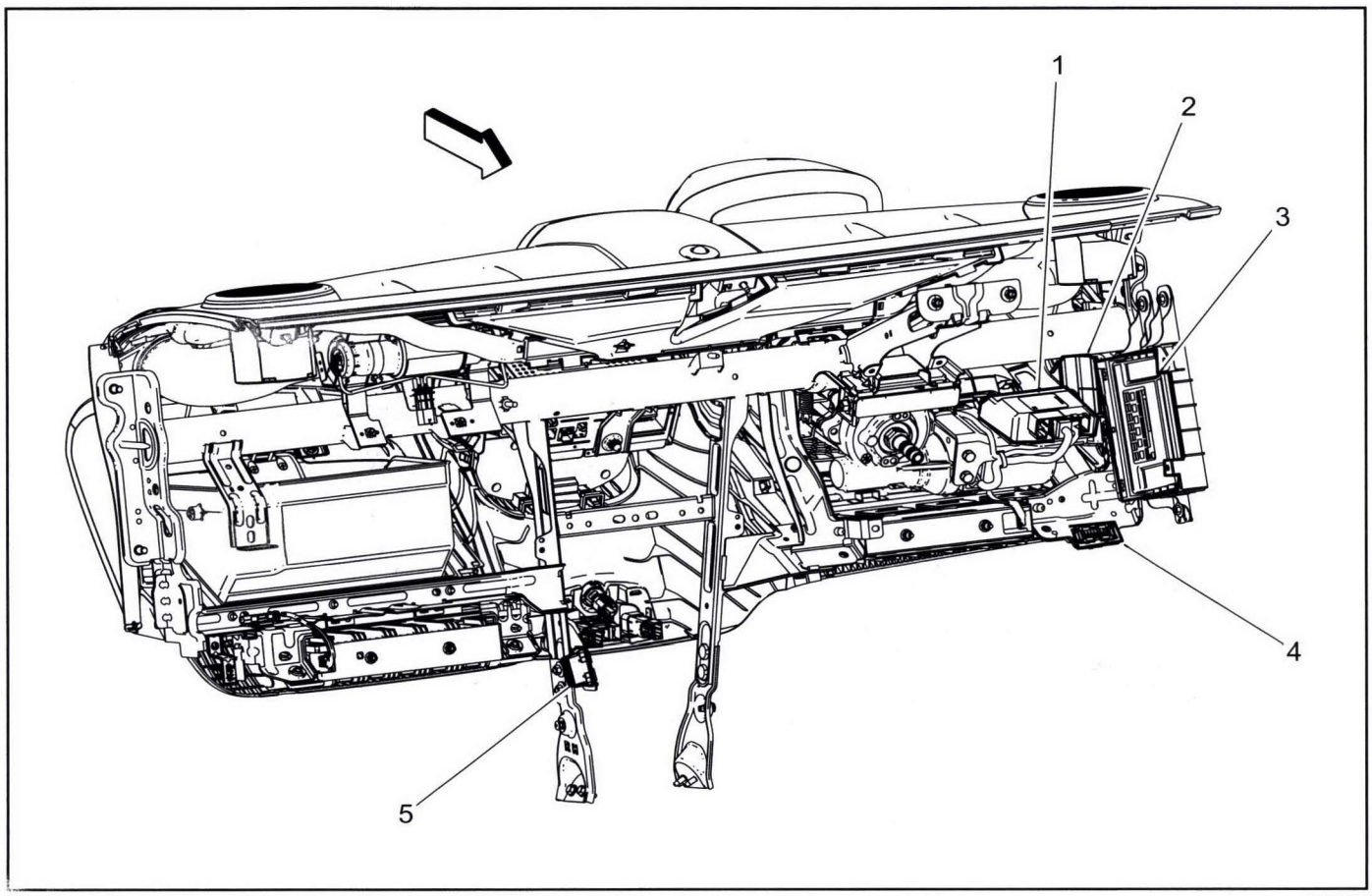


3216360

Items

(1) K33 HVAC Control Module
(2) B7F Air Temperature Sensor - Duct Upper
(3) M8 Blower Motor
(4) K8 Blower Motor Control Module

Rear of Instrument Panel Components

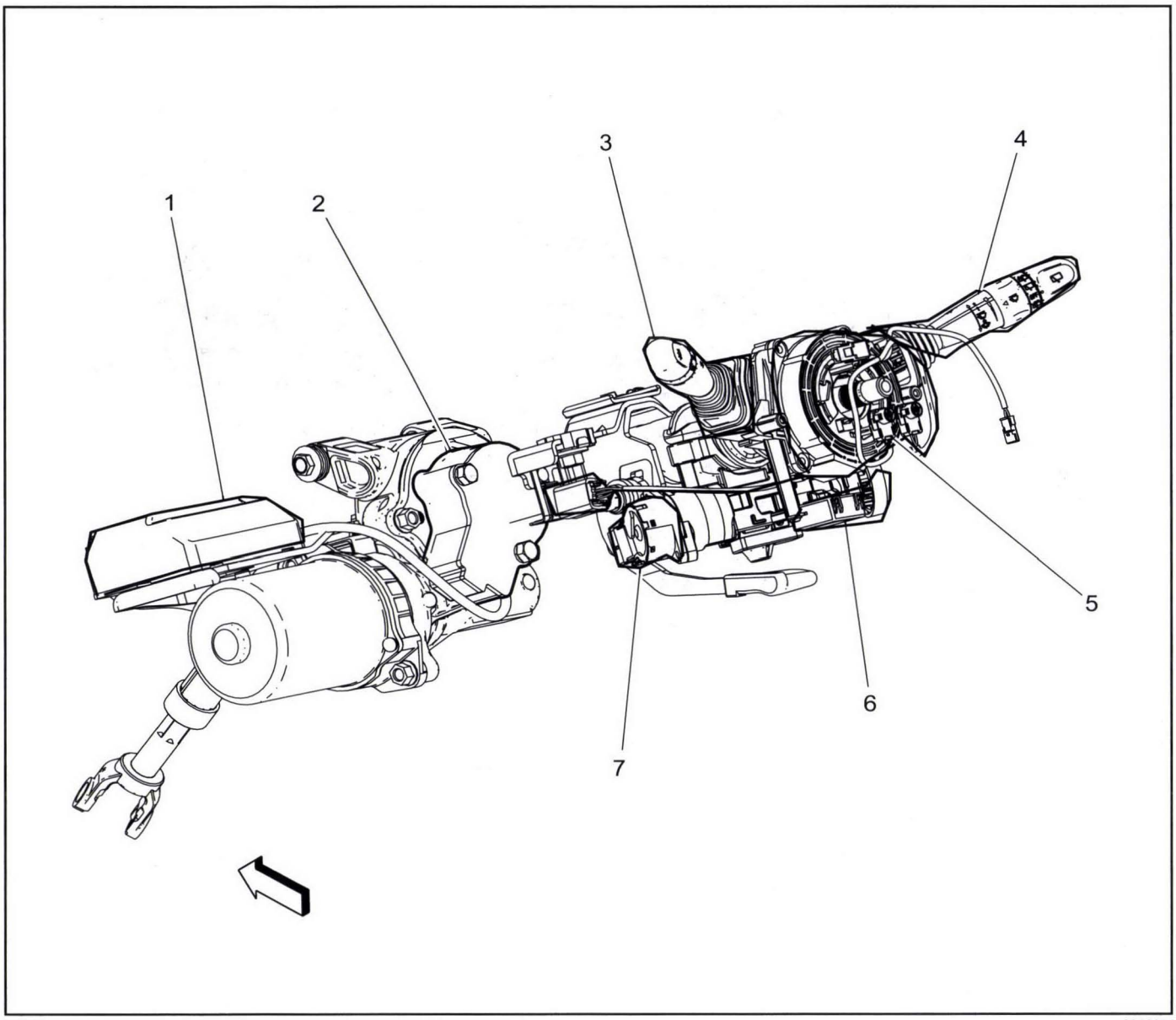


3216345

Items

(1) K43 Power Steering Control Module
(2) X51A Fuse Block - Instrument Panel
(3) K9 Body Control Module
(4) X84 Data Link Connector
(5) X84B Auxiliary Data Connector

Steering Column Components

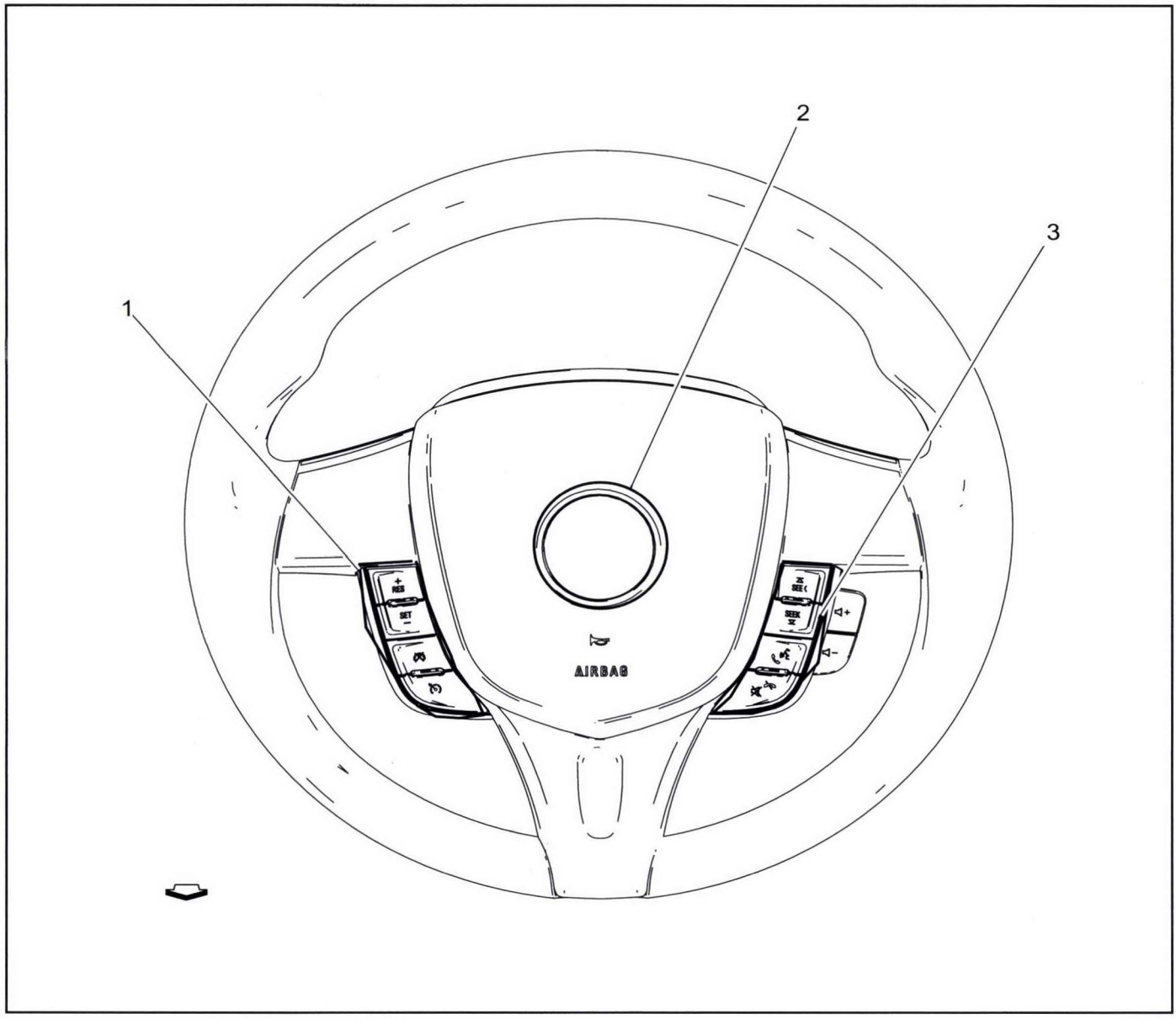


3216354

Items

(1) K43 Power Steering Control Module
(2) B137 Power Steering Shaft Torque Sensor
(3) S78 Turn Signal/Multifunction Switch
(4) S82 Windshield Wiper/Washer Switch
(5) X85 Steering Wheel Air Bag Coil
(6) K89 Immobilizer Control Module
(7) S39 Ignition Switch (-BTM)

Steering Wheel Components



3216358

Items

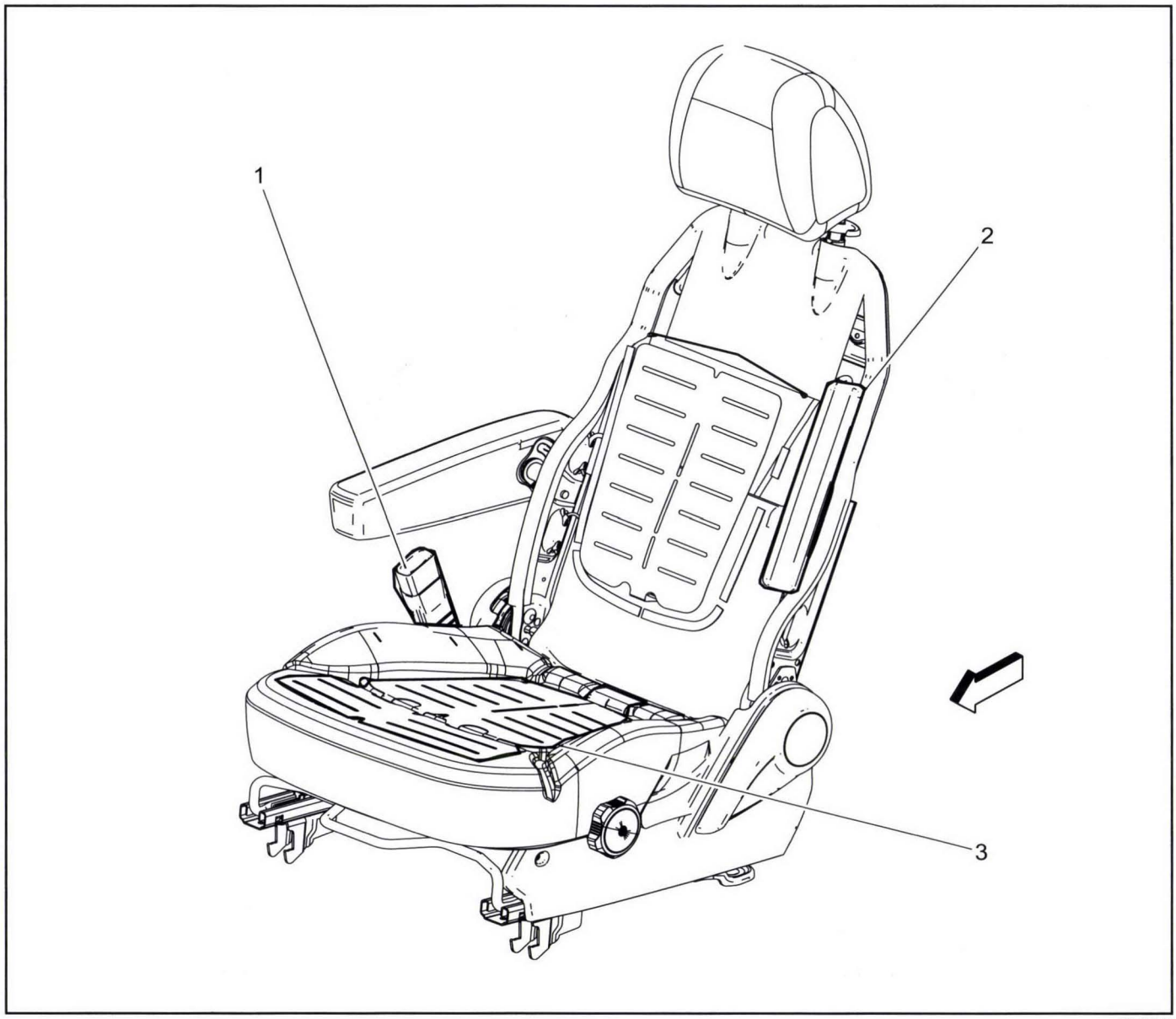
(1) S70L Steering Wheel Controls Switch - Left (K34)

(2) F107 Steering Wheel Air Bag

(3) S70R Steering Wheel Controls Switch - Right

Passenger Compartment/Roof Component Views

Driver Seat Components



3216323

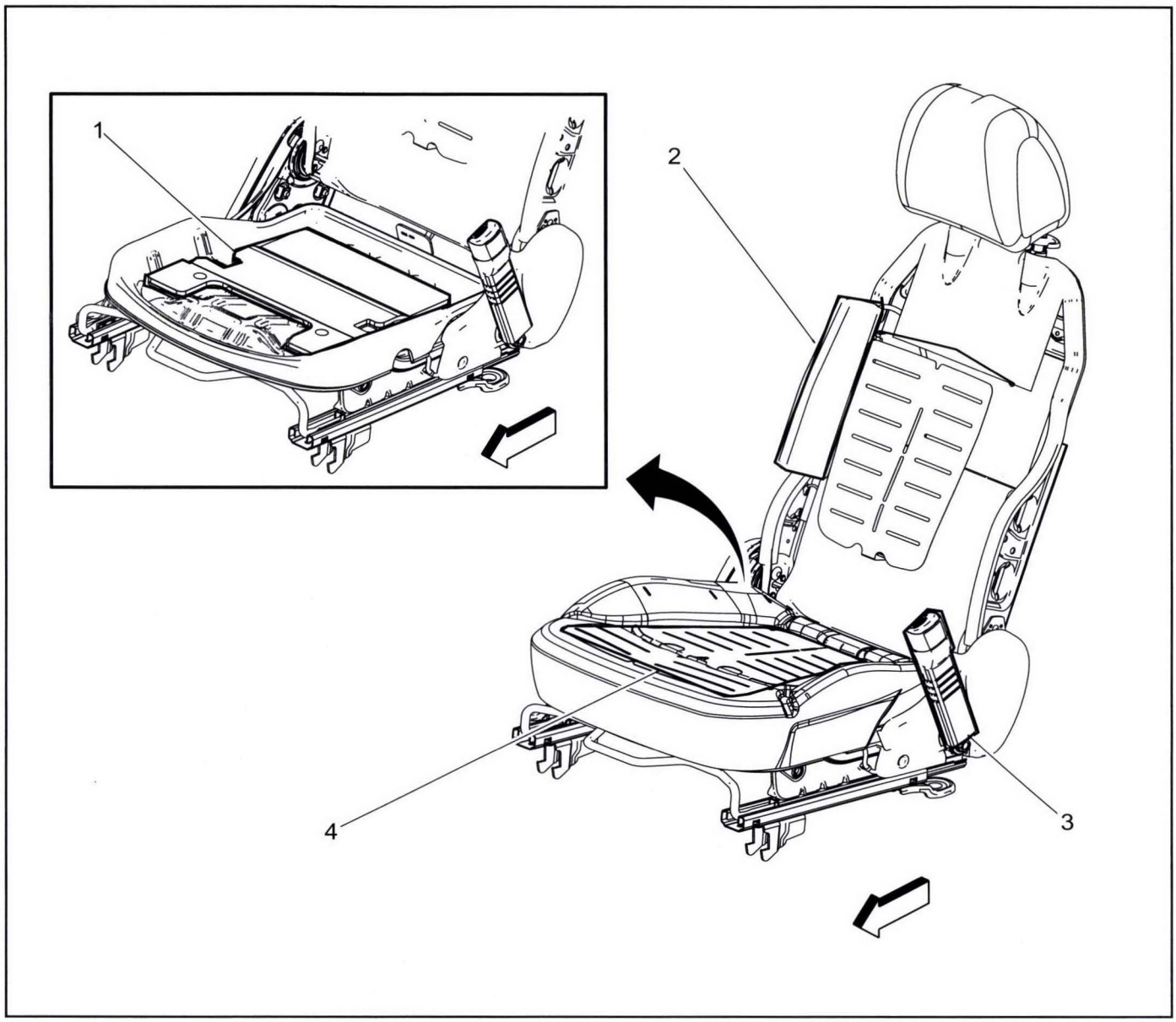
Items

(1) B88D Seat Belt Switch - Driver (AYF/AW7)

(2) F106LF Seat Side Air Bag - Left Front (AYF/AW7)

(3) E14B Seat Heating Element - Driver Cushion

Passenger Seat Components



3216327

Items

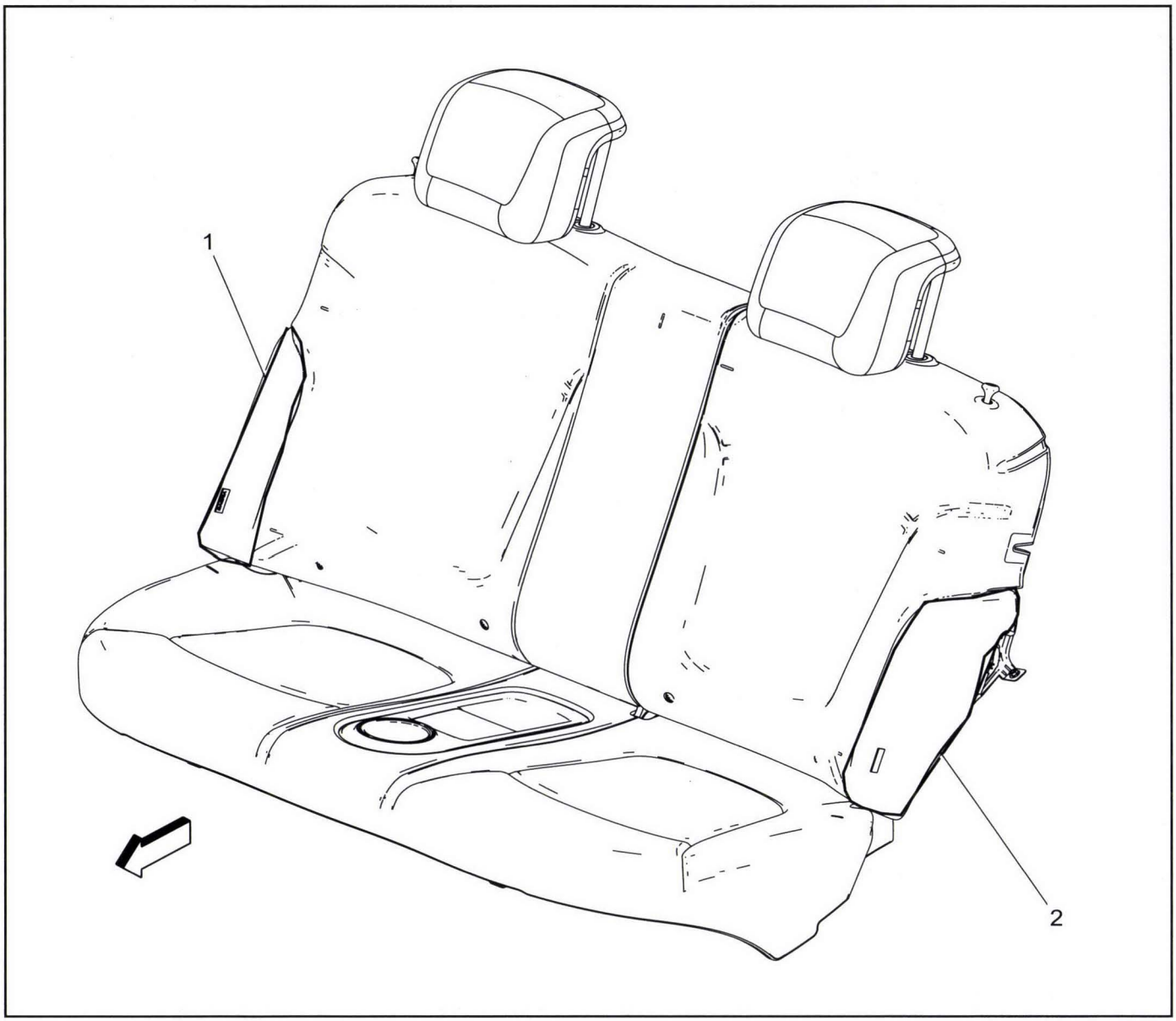
(1) B60 Passenger Presence Sensor (AW7)

(2) F106RF Seat Side Air Bag - Right Front (AYF/AW7)

(3) B61P Seat Belt Tension Sensor - Passenger (AYF)

(4) E14B Seat Heating Element - Driver Cushion

Rear Seat Components



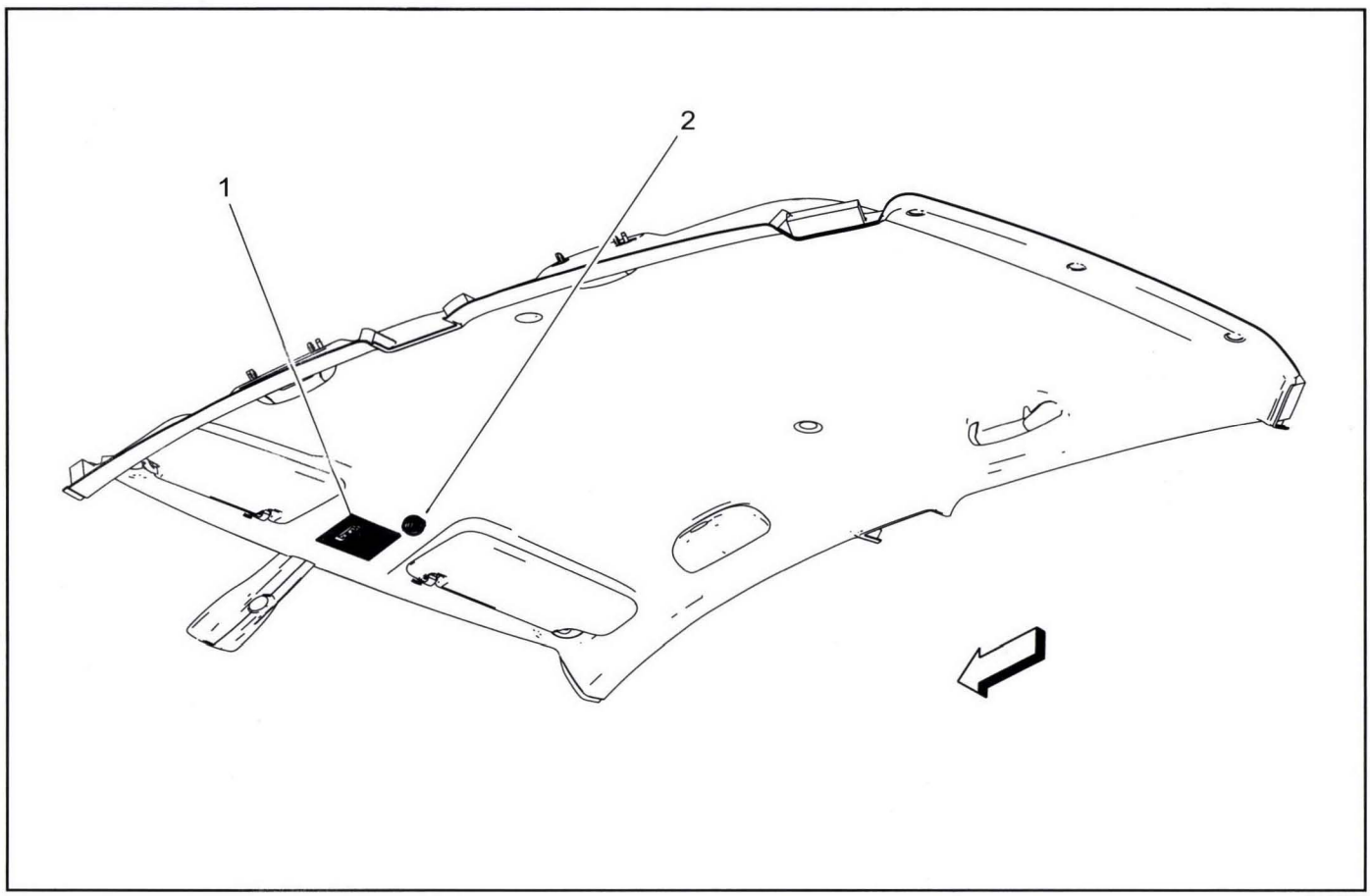
3216331

Items

(1) F106RR Seat Side Air Bag - Right Rear (AYF/AW7)

(2) F106LR Seat Side Air Bag - Left Rear (AYF/AW7)

Headliner Components (-UE1)



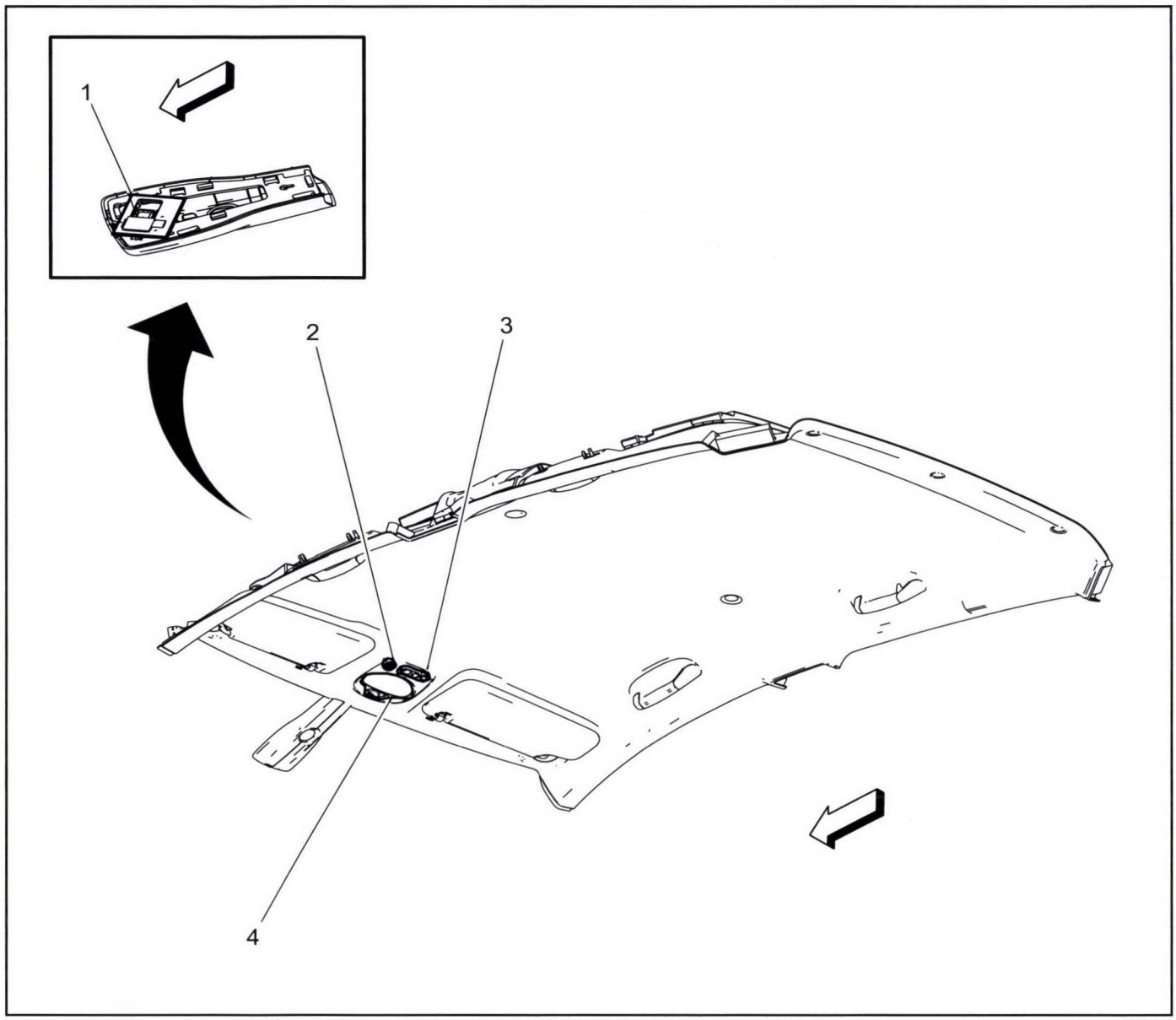
3216333

Items

(1) E36AH Dome Lamp

(2) B24 Cellular Phone Microphone (UE1)

Headliner Components (UE1)



3216335

Items

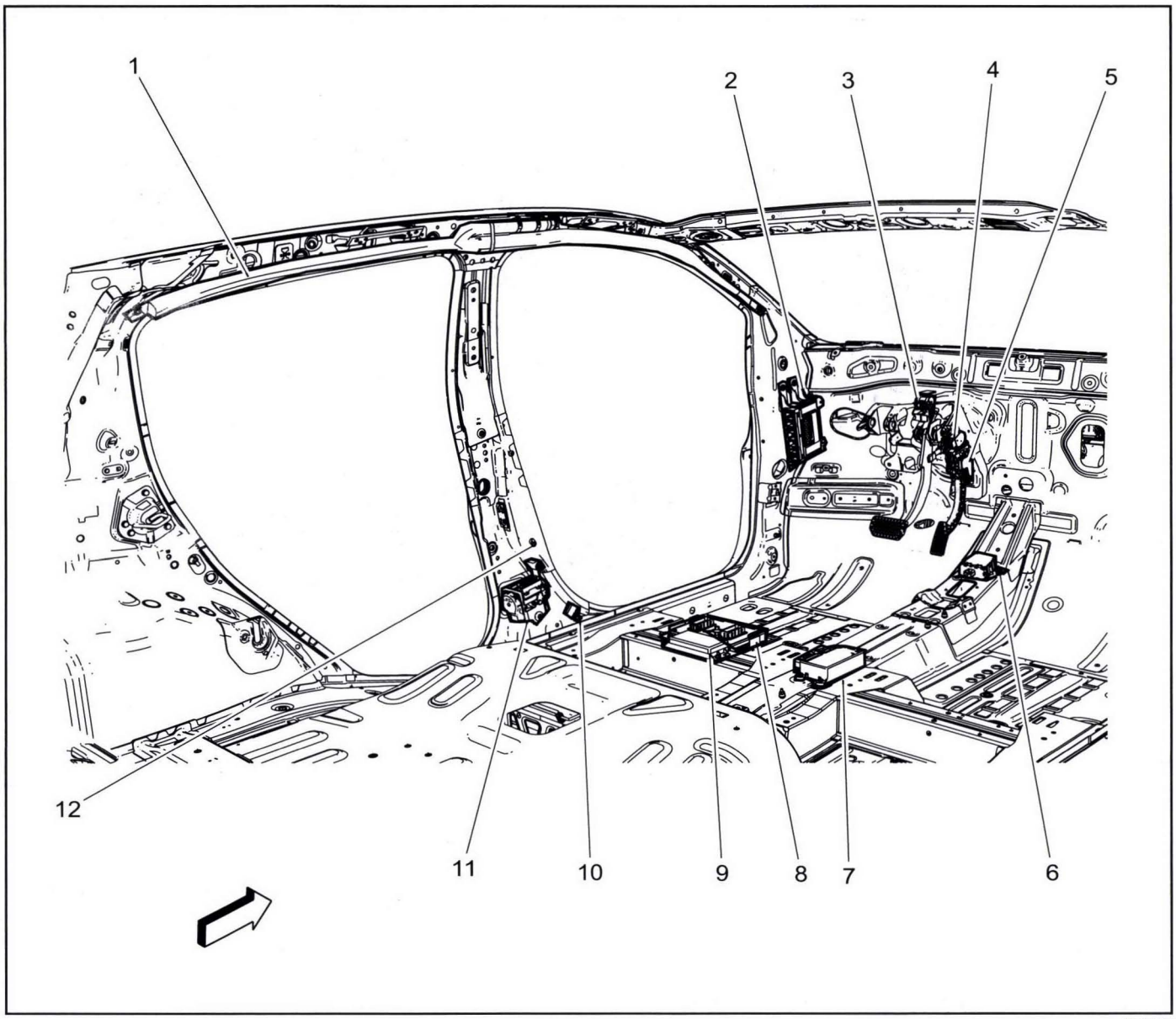
(1) B160 Windshield Temperature and Inside Moisture Sensor

(2) B24 Cellular Phone Microphone (UE1)

(3) S51 Telematics Button Assembly (UE1)

(4) E36AH Dome Lamp

Left Front of Passenger Compartment Components

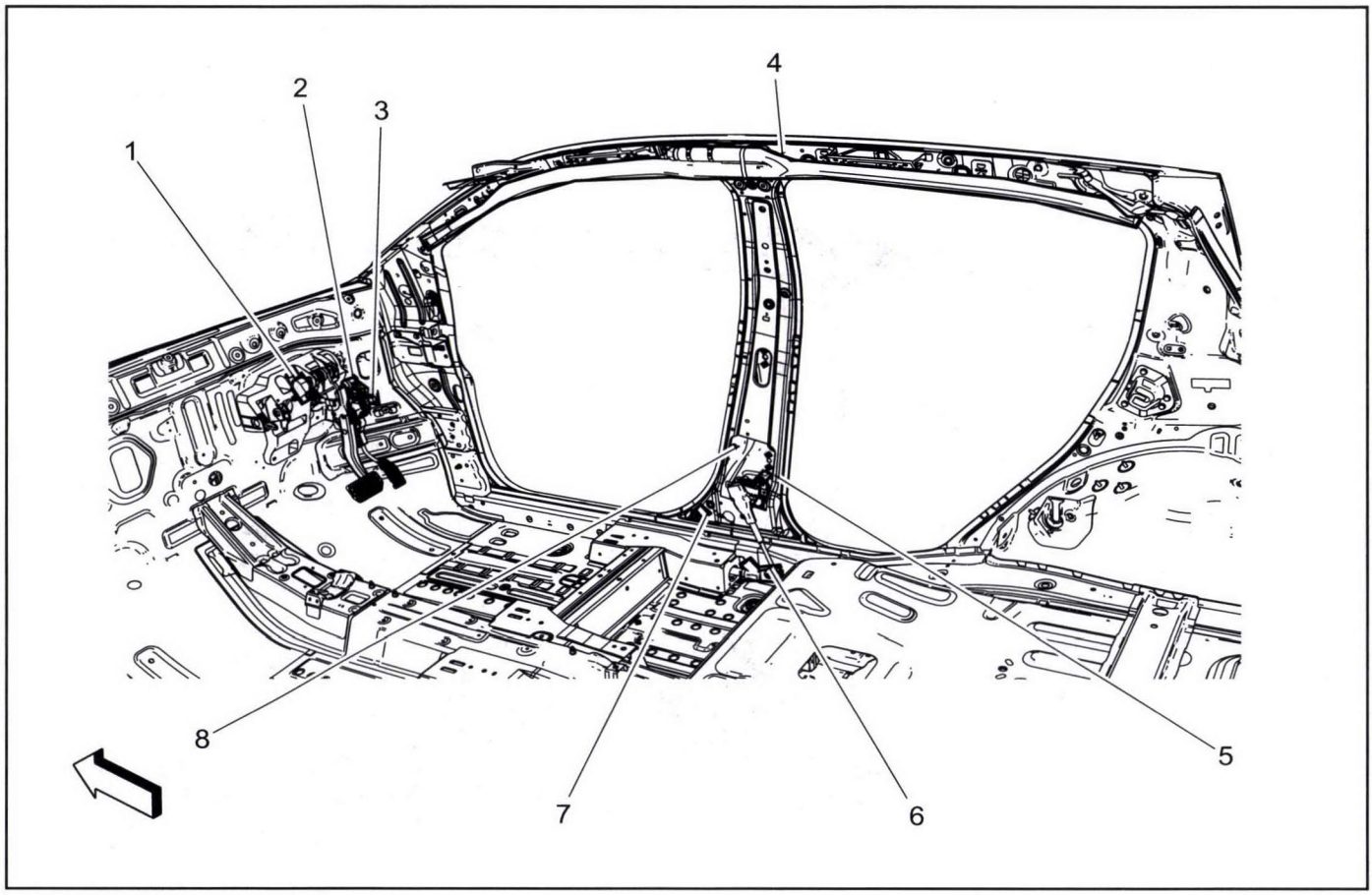


3216337

Items

(1) F105L Roof Rail Air Bag - Left (AYF/AW7)
(2) K9 Body Control Module
(3) B22 Brake Pedal Position Sensor
(4) B201 Brake Control Brake Pedal Position Sensor
(5) B107 Accelerator Pedal Position Sensor
(6) K132 Pedestrian Alert Sound Control Module
(7) K36 Inflatable Restraint Sensing and Diagnostic Module
(8) K114B Hybrid/EV Powertrain Control Module 2
(9) C3 Telematics Communication Interface Control Module Battery (UE1)
(10) B63LR Side Impact Sensor - Left Rear (AYF/AW7)
(11) F112D Seat Belt Retractor Pretensioner - Driver
(12) B28D Door Ajar Switch - Driver

Right Front of Passenger Compartment Components



3216343

Items

(1) B201 Brake Control Brake Pedal Position Sensor

(2) B22 Brake Pedal Position Sensor

(3) B107 Accelerator Pedal Position Sensor

(4) F105L Roof Rail Air Bag - Left (AYF/AW7)

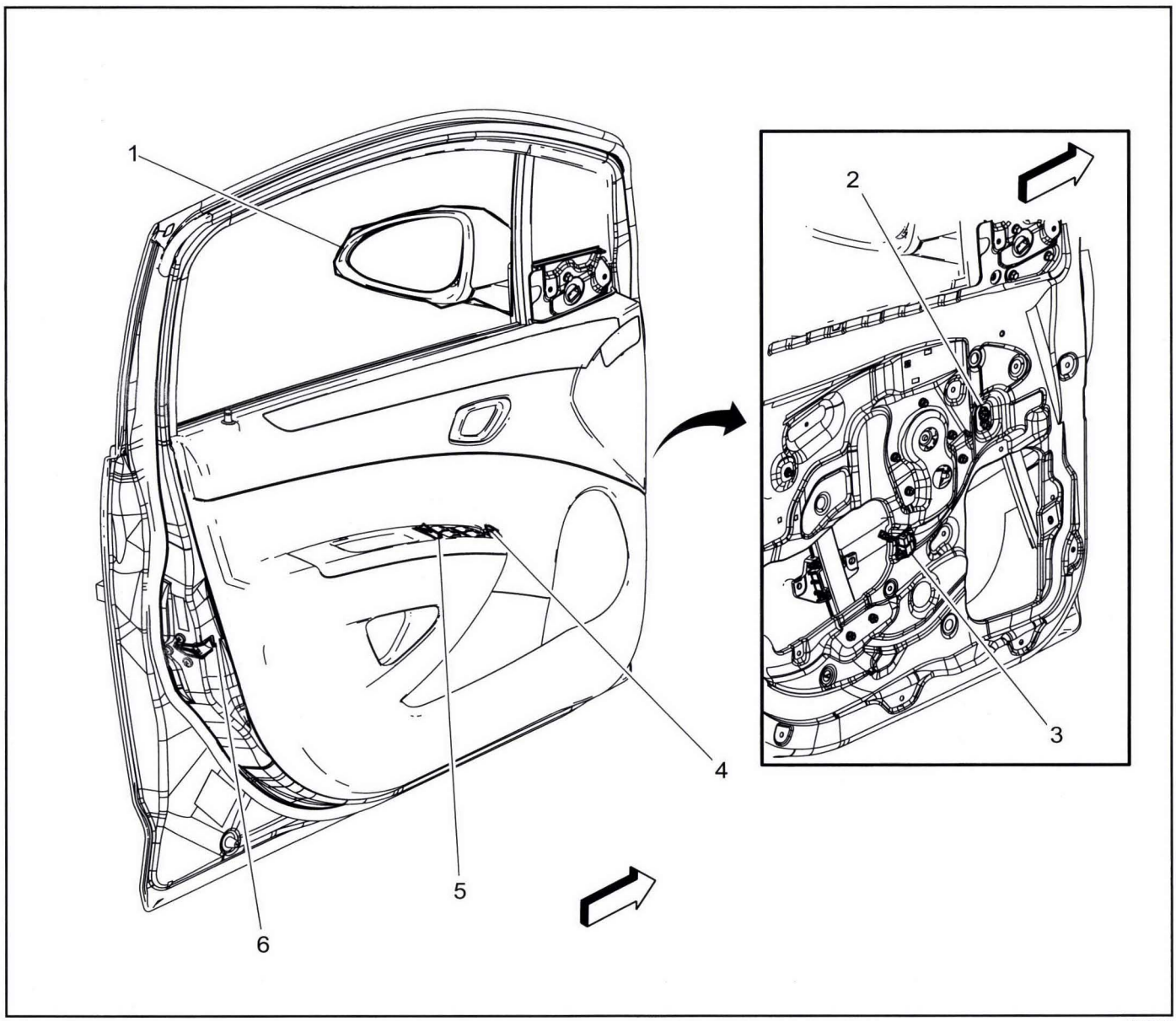
(5) F112D Seat Belt Retractor Pretensioner - Driver

(6) F113D Seat Belt Anchor Pretensioner - Driver

(7) B63RR Side Impact Sensor - Right Rear (AYF/AW7)

(8) B28D Door Ajar Switch - Driver

Door Component Views
Driver Door Components

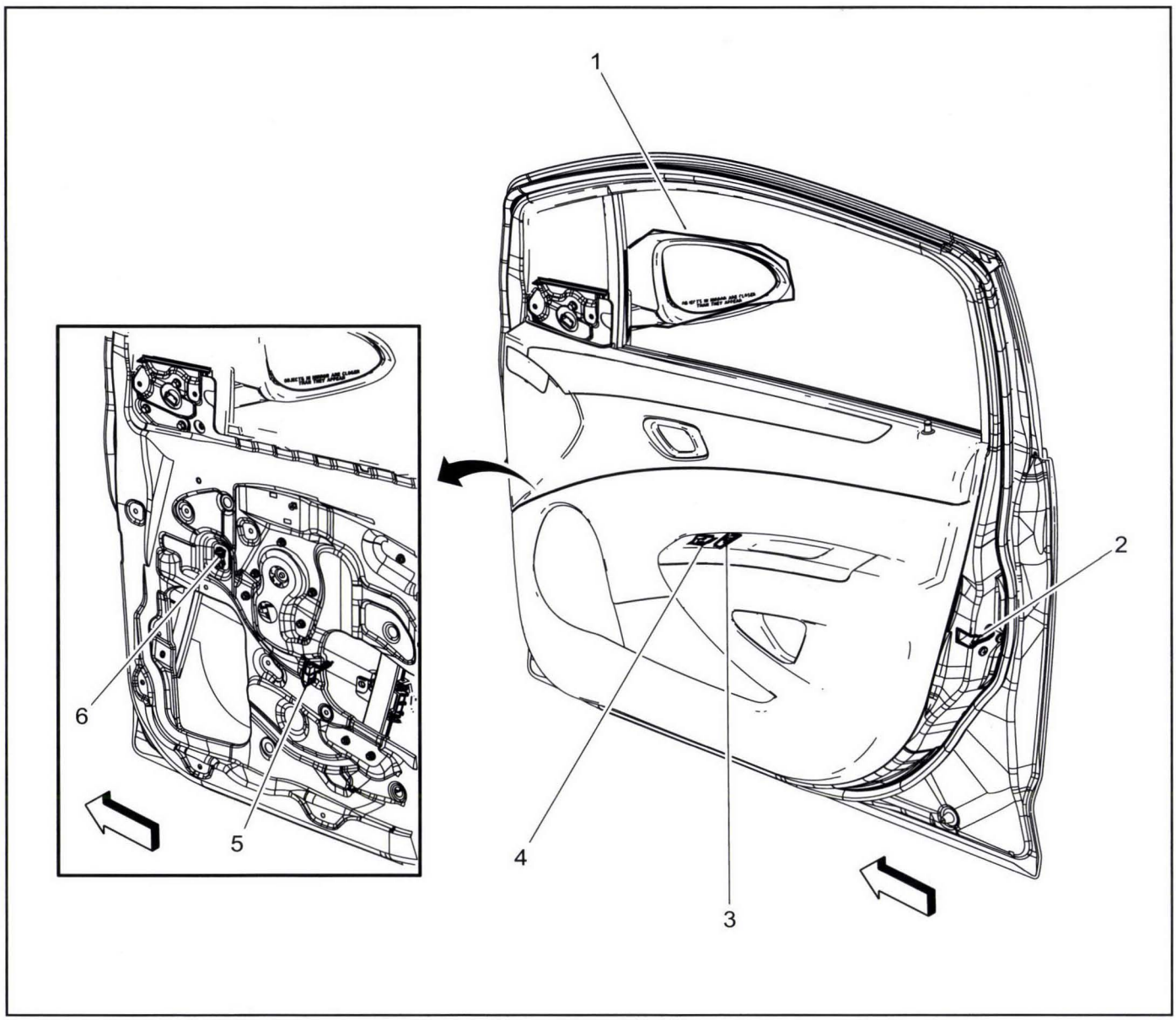


3216311

Items

(1) A9A Outside Rearview Mirror - Driver
(2) B63LF Side Impact Sensor - Left Front (AYF/AW7)
(3) M74D Window Motor - Driver
(4) S79D Window Switch - Driver
(5) S13D Door Lock Switch - Driver
(6) A23D Door Latch Assembly - Driver

Passenger Door Components

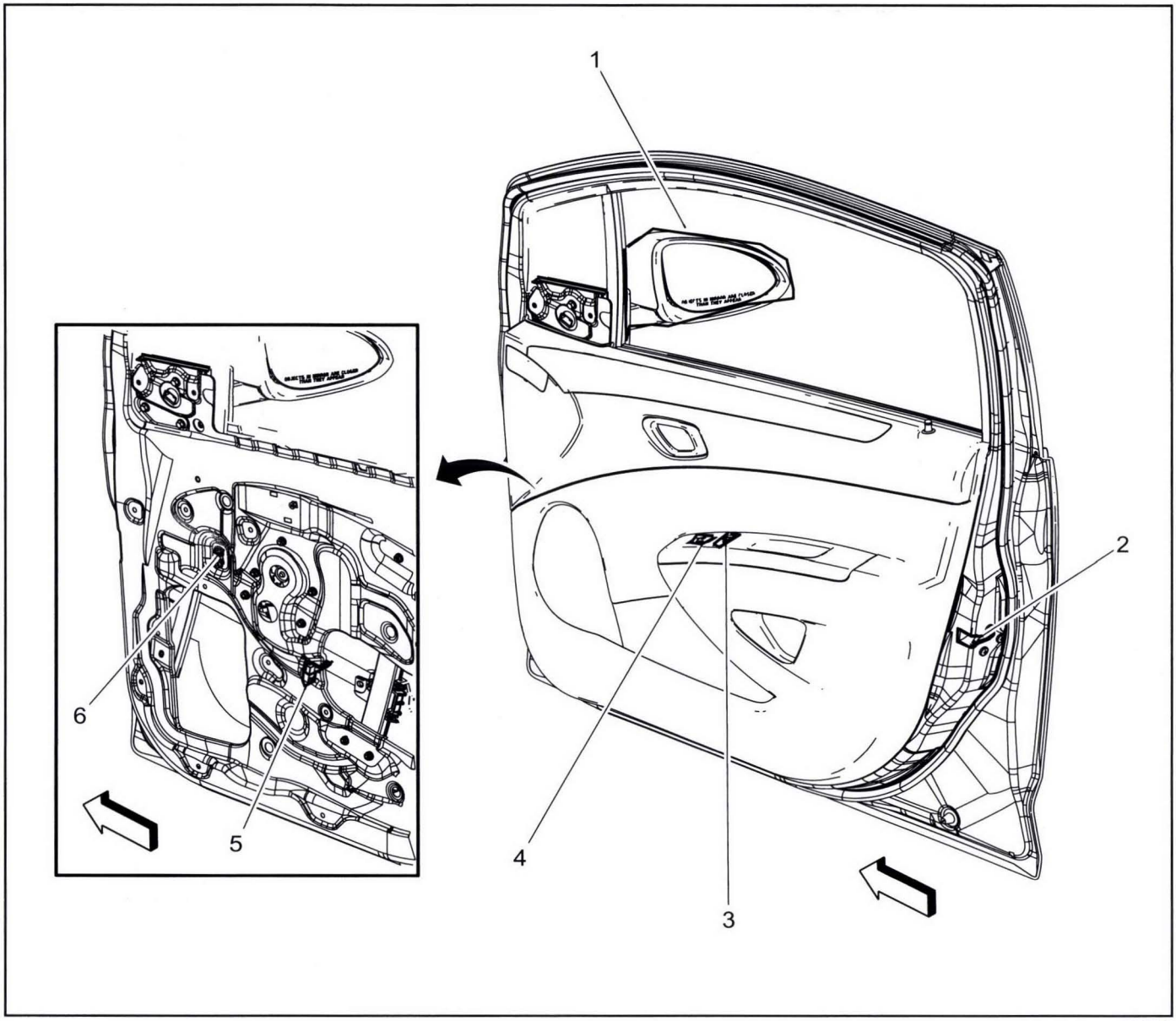


3216313

Items

(1) A9B Outside Rearview Mirror - Passenger
(2) A23P Door Latch Assembly - Passenger
(3) S13P Door Lock Switch - Passenger
(4) S79P Window Switch - Passenger
(5) M74P Window Motor - Passenger
(6) B63RF Side Impact Sensor - Right Front (AYF/AW7)

Passenger Door Components

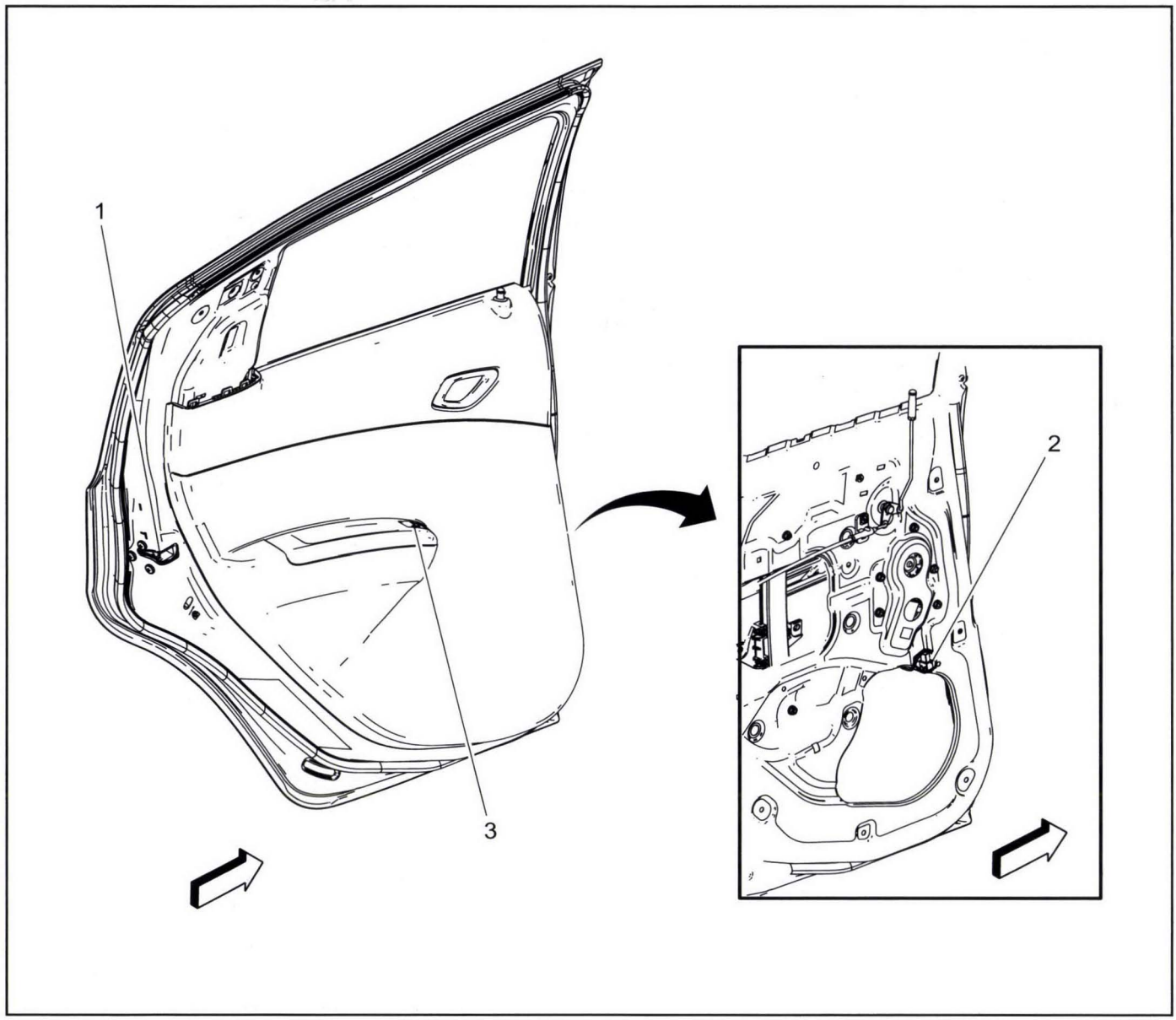


3216313

Items

(1) A9B Outside Rearview Mirror - Passenger
(2) A23P Door Latch Assembly - Passenger
(3) S13P Door Lock Switch - Passenger
(4) S79P Window Switch - Passenger
(5) M74P Window Motor - Passenger
(6) B63RF Side Impact Sensor - Right Front (AYF/AW7)

Left Rear Door Components

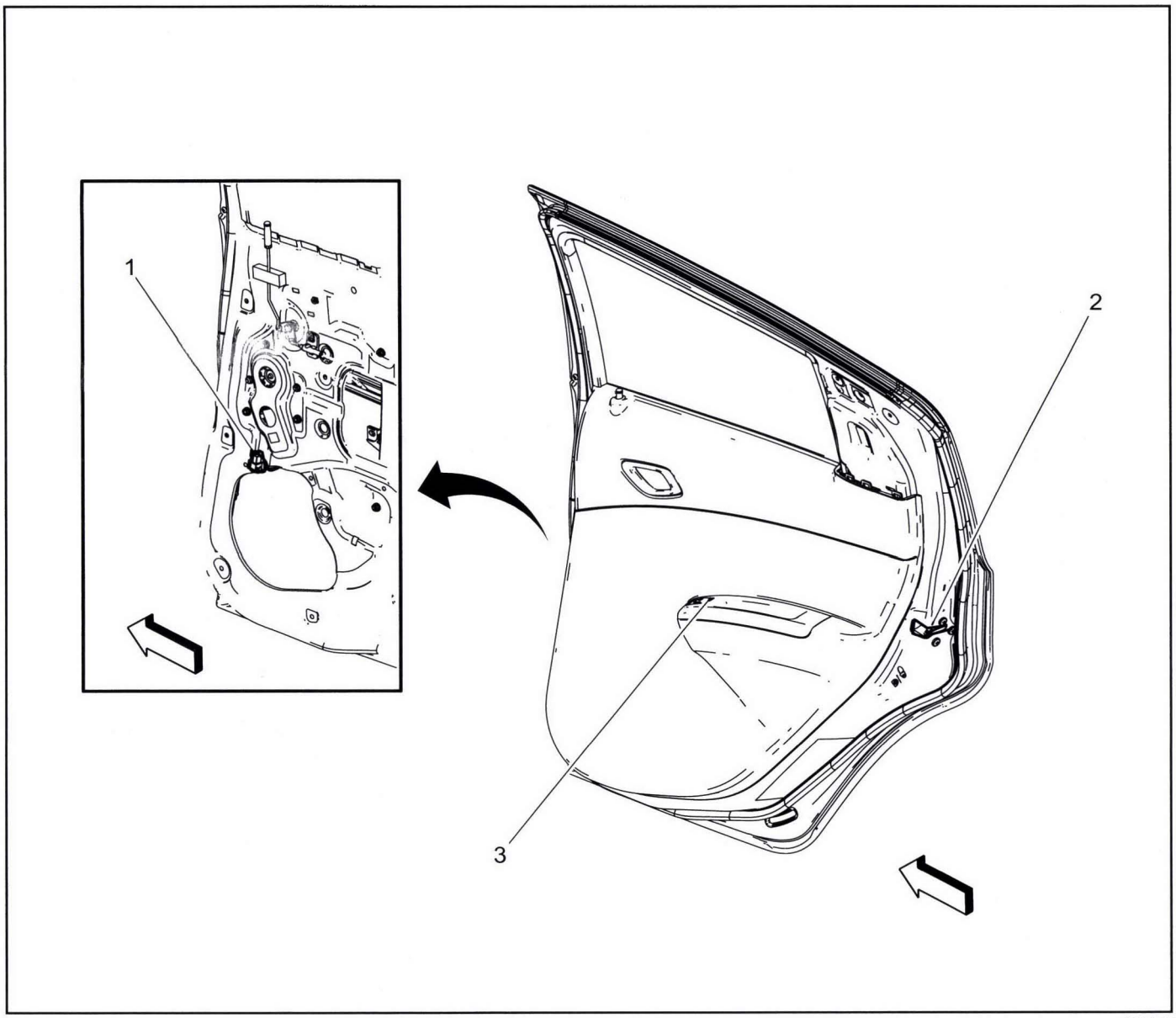


3216319

Items

(1) A23LR Door Latch Assembly - Left Rear
(2) M74LR Window Motor - Left Rear
(3) S79LR Window Switch - Left Rear

Right Rear Door Components

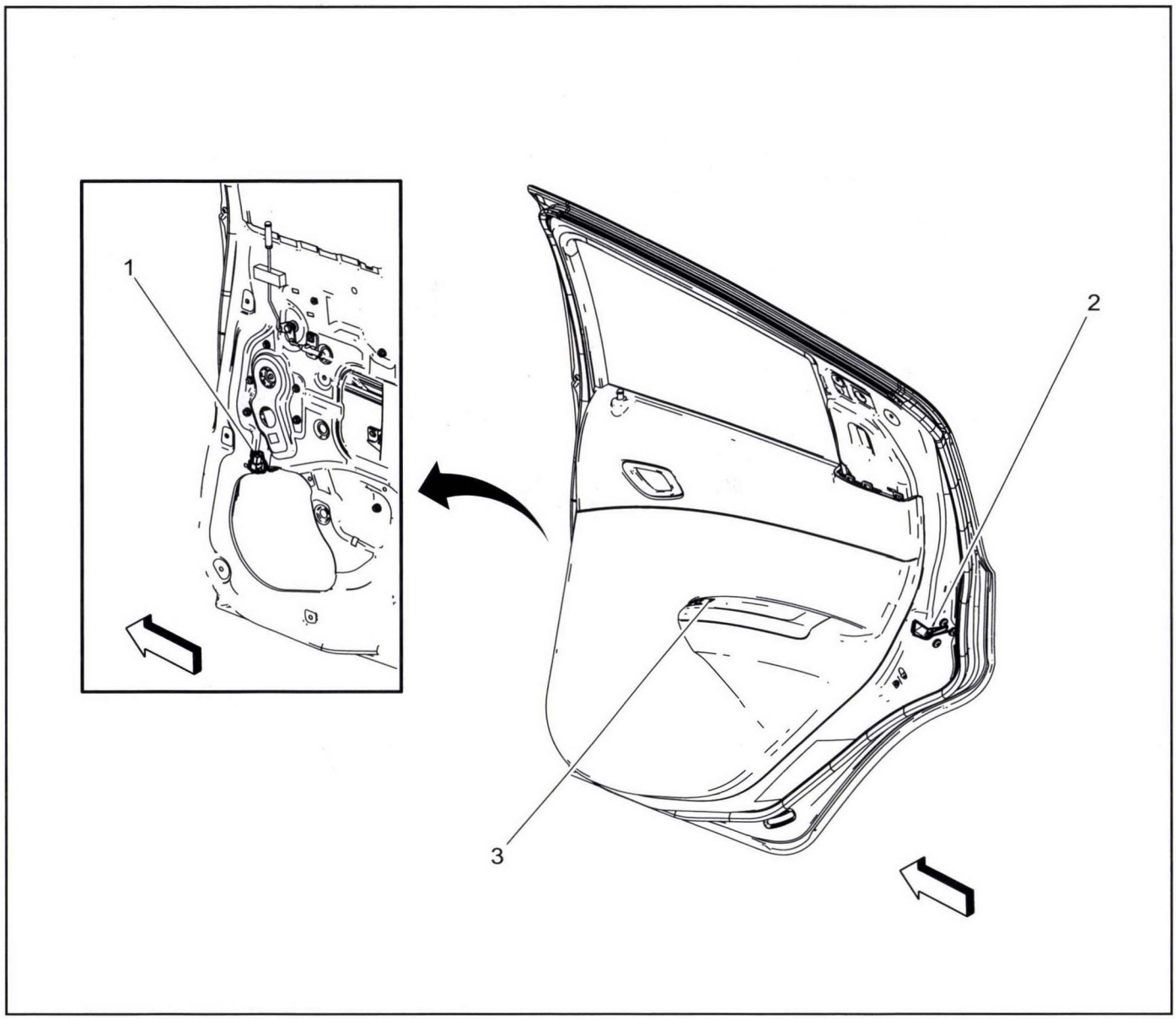


3216321

Items

(1) M74RR Window Motor - Right Rear
(2) A23RR Door Latch Assembly - Right Rear
(3) S79RR Window Switch - Right Rear

Right Rear Door Components

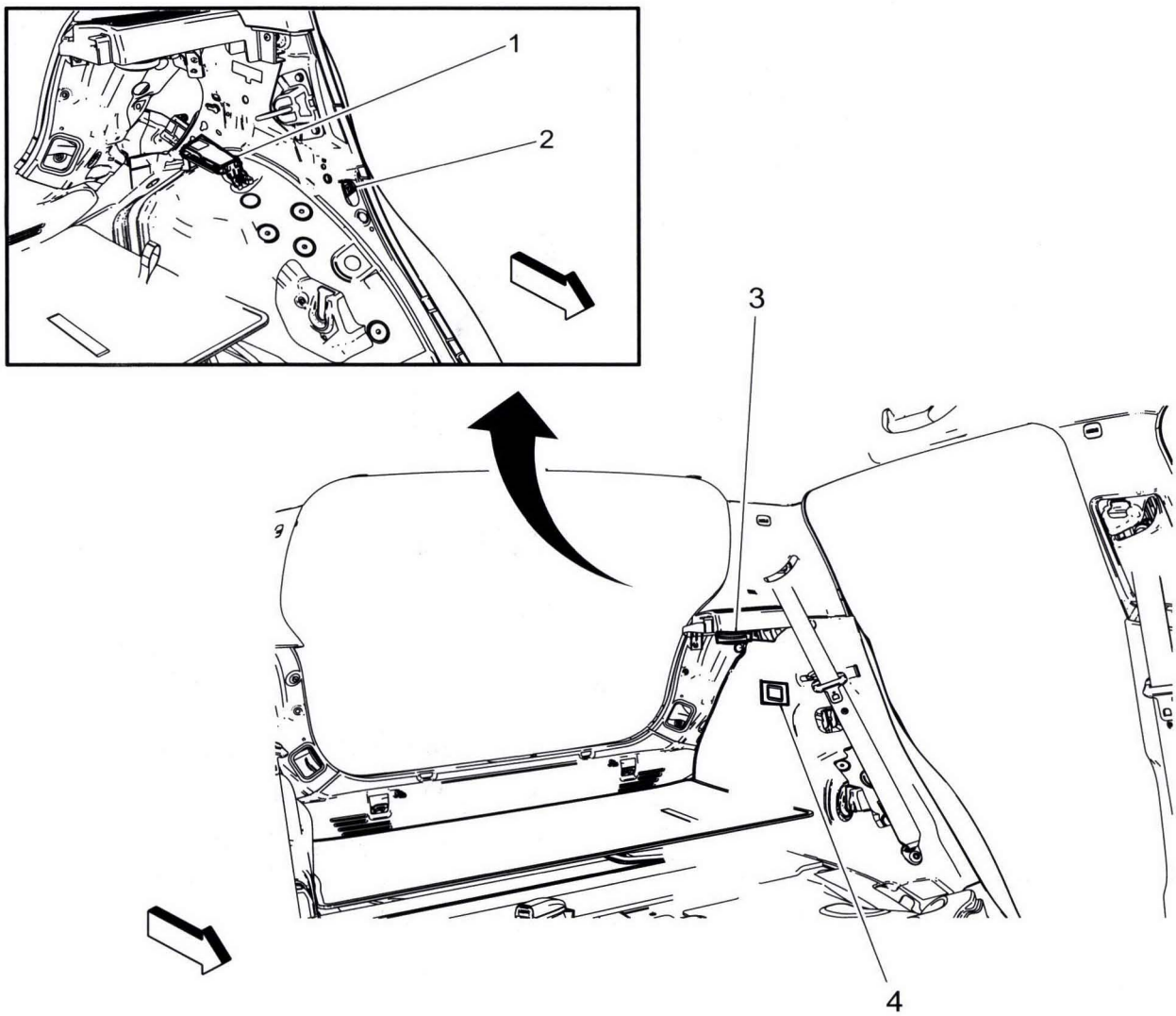


3216321

Items

(1) M74RR Window Motor - Right Rear
(2) A23RR Door Latch Assembly - Right Rear
(3) S79RR Window Switch - Right Rear

Luggage Compartment/Rear of Vehicle Component Views
Left Side Luggage Compartment Components

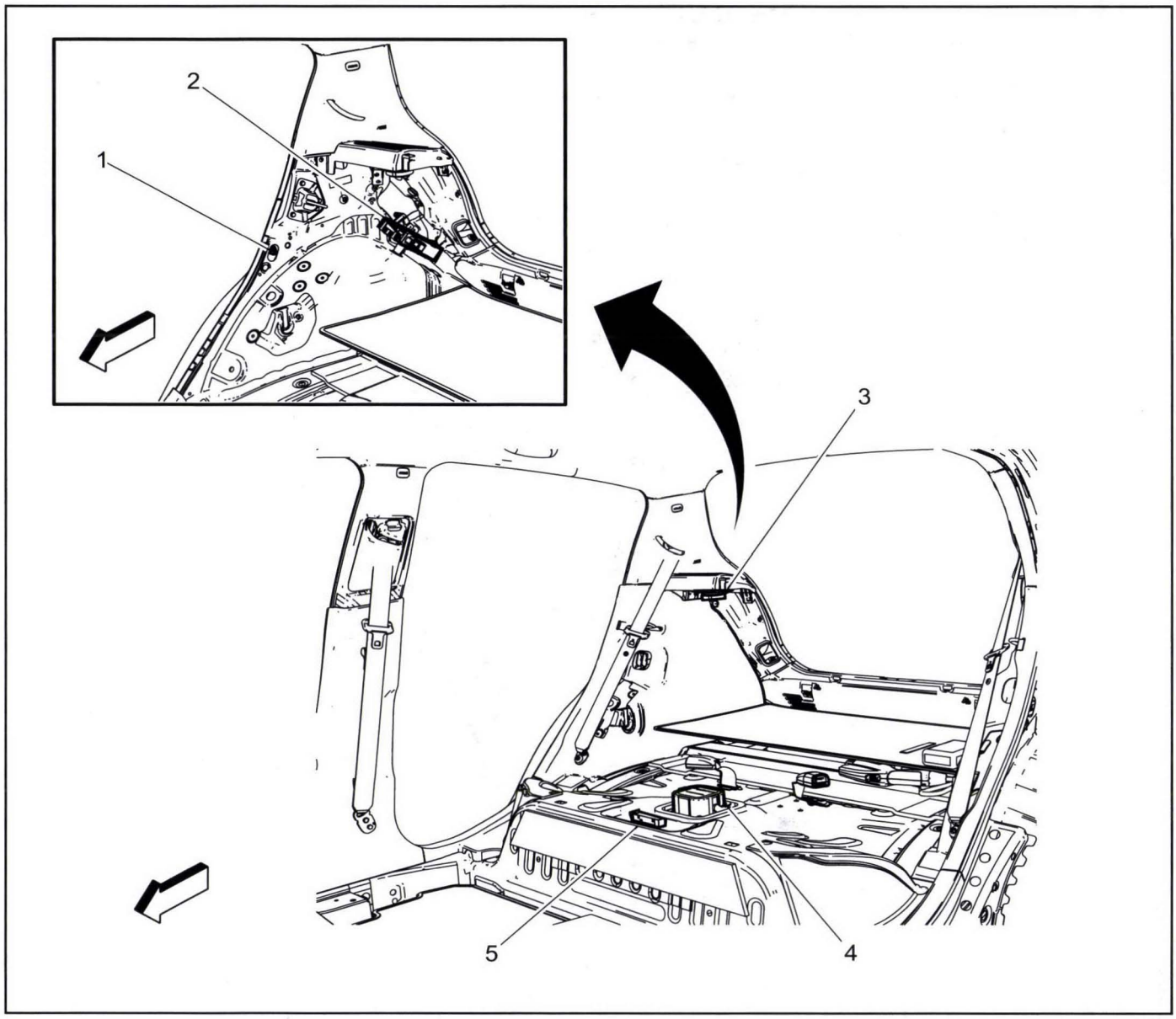


3216376

Items

(1) K77 Remote Control Door Lock Receiver
(2) B28LR Door Ajar Switch - Left Rear
(3) P19L Speaker - Left Rear Compartment
(4) E33 Cargo Lamp

Right Side Luggage Compartment Components

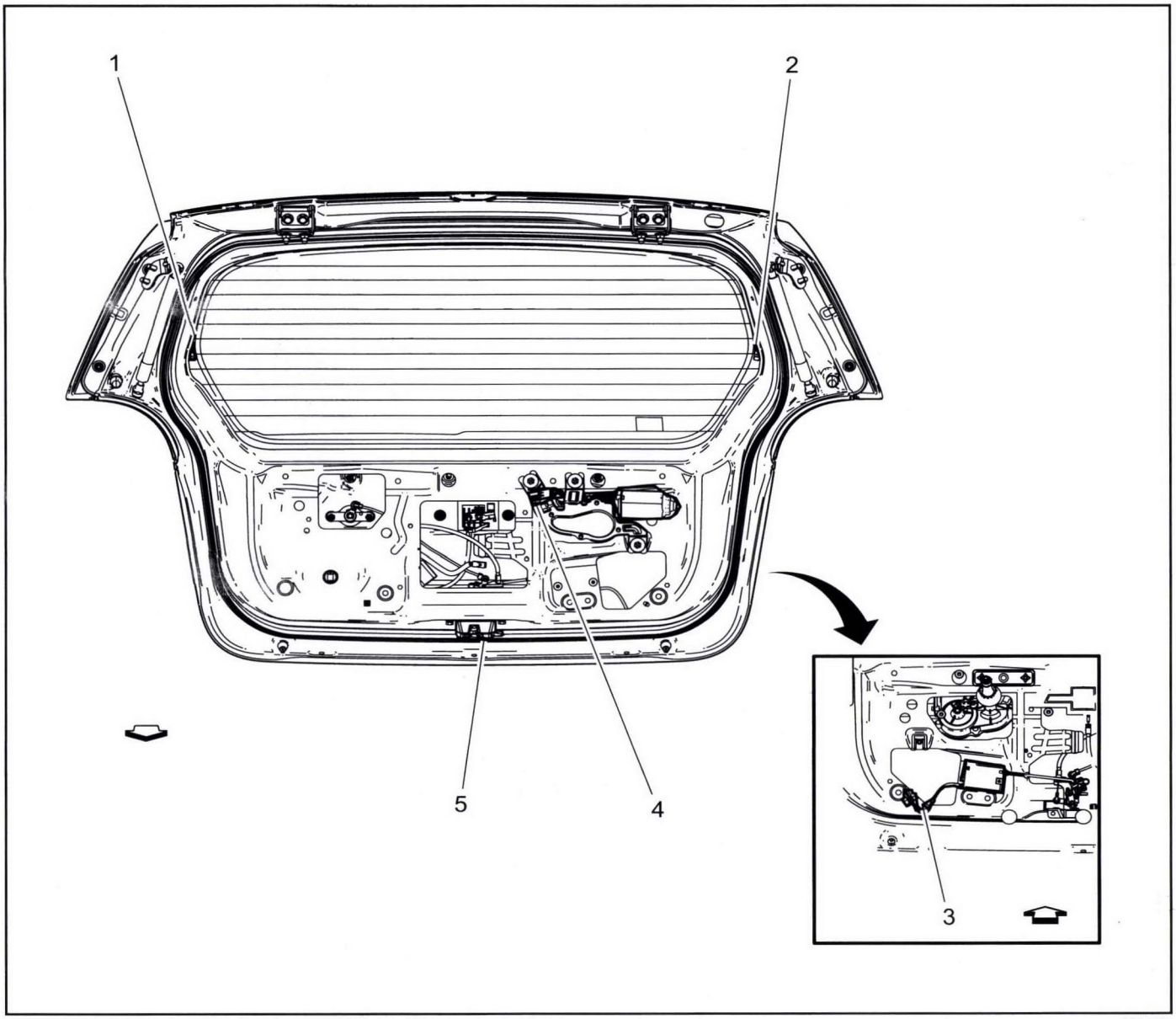


3216378

Items

(1) B28RR Door Ajar Switch - Right Rear
(2) K84 Keyless Entry Control Module
(3) P19Y Speaker - Right Rear Compartment
(4) S15 Manual Service Disconnect
(5) T10K Keyless Entry Antenna - Center Console Rear (BTM)

Liftgate Components

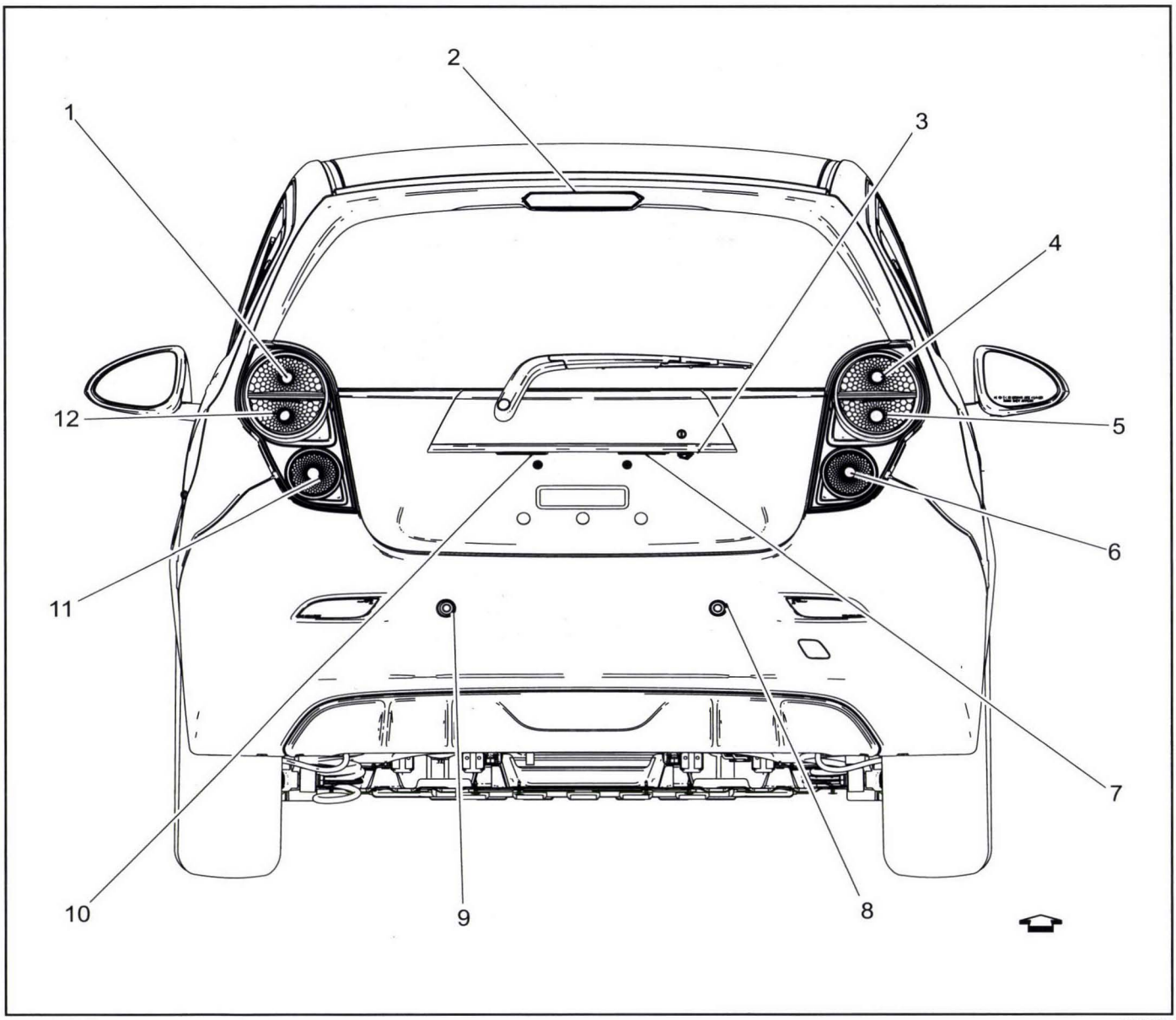


3216381

Items

(1) E18 Rear Defogger Grid
(2) E18 Rear Defogger Grid
(3) M14B Door Lock Actuator - Liftgate
(4) M45 Rear Wiper Motor
(5) B69 Liftgate Ajar Switch

Rear of Vehicle Components

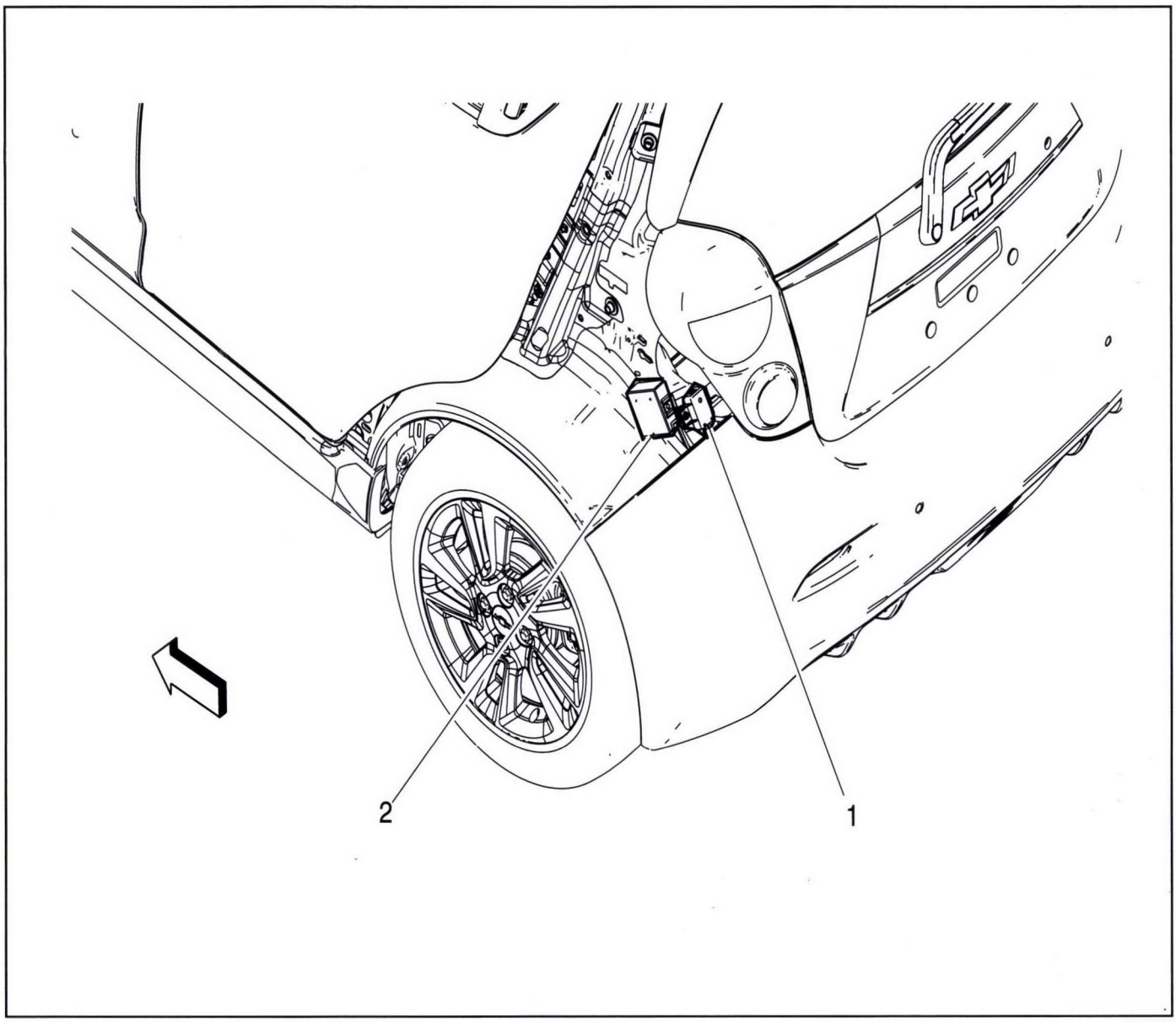


3216383

Items

(1) E5AA Tail/Stop Lamp - Left
(2) E6 Center High Mounted Stop Lamp
(3) B87 Rearview Camera (UV7)
(4) E5AB Tail/Stop Lamp - Right
(5) E5AB Tail/Stop Lamp - Right
(6) E5B Backup Lamp - Right
(7) E7L License Plate Lamp - Left
(8) B78H Rear Object Sensor - Right Outer (UD7)
(9) B78G Rear Object Sensor - Left Outer (UD7)
(10) E7L License Plate Lamp - Left
(11) E5A Backup Lamp - Left
(12) E5AA Tail/Stop Lamp - Left

Left Rear Vehicle Components



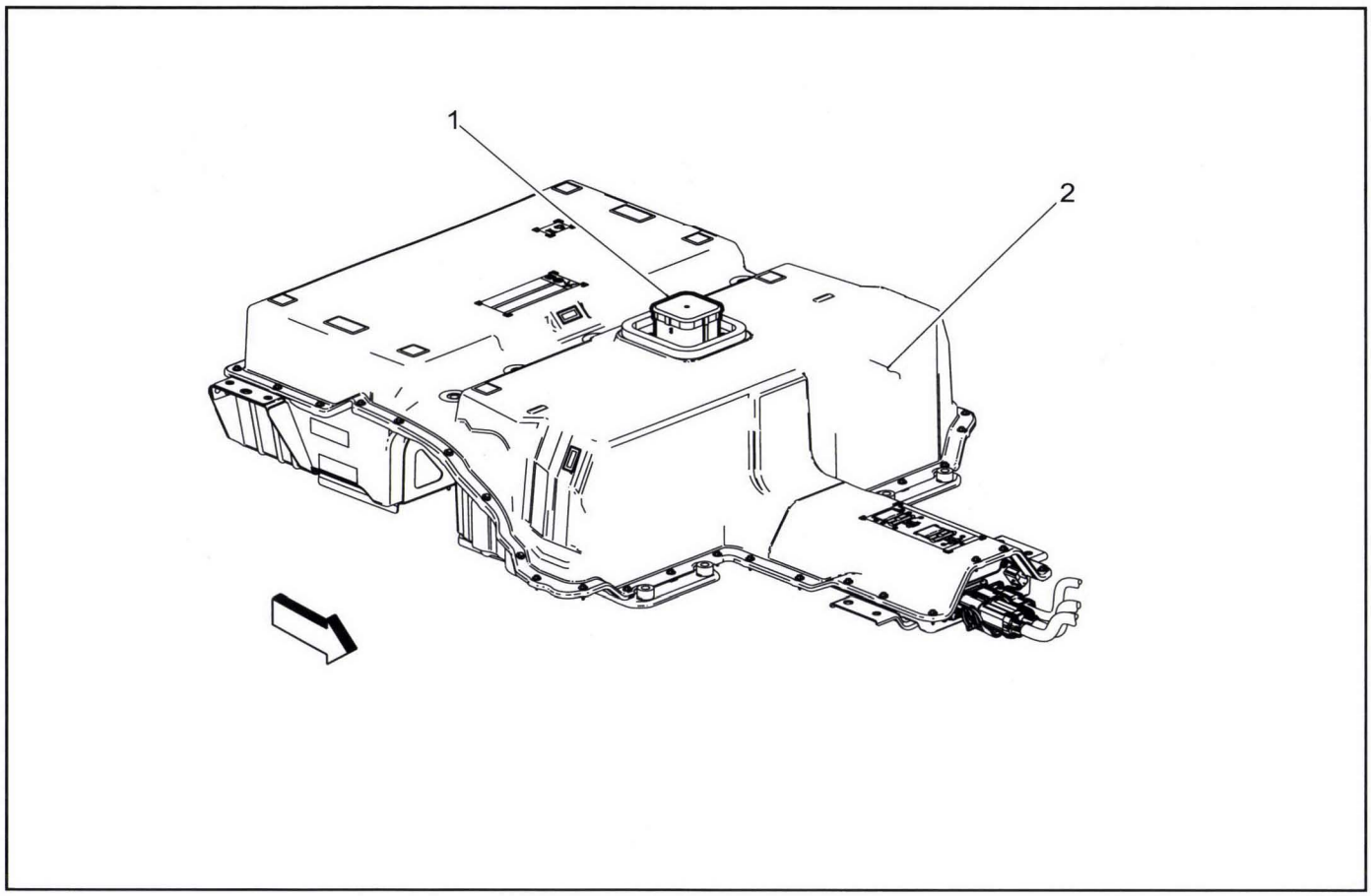
3216385

Items

(1) P28 Speaker - Parking Assist (UD7)

(2) K41R Rear Parking Assist Control Module (UD7)

Wheels/Vehicle Underbody Component Views
Underbody - Hybrid/EV Battery Pack Components (1 of 3)



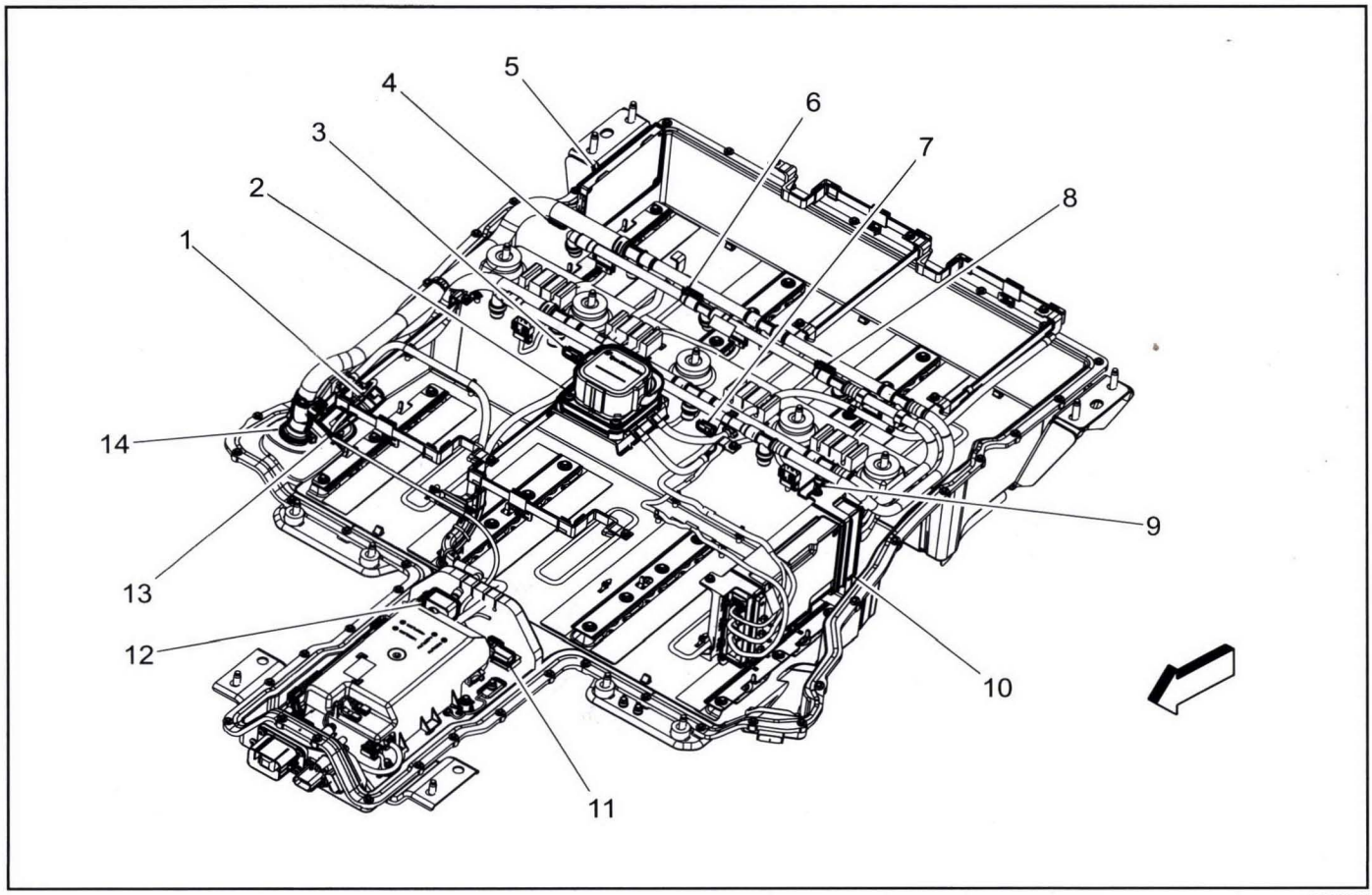
3216389

Items

(1) S15 Manual Service Disconnect

(2) A4 Hybrid/EV Battery Pack

Underbody - Hybrid/EV Battery Pack Components (2 of 3)



3968959

Items

(1) B204B Hybrid/EV Battery Pack Coolant Temperature Sensor 2

(2) X21 Manual Service Disconnect Receptacle

(3) B32A Hybrid/EV Battery Temperature Sensor 1

(4) B32F Hybrid/EV Battery Temperature Sensor 6

(5) K112

(6) B32E Hybrid/EV Battery Temperature Sensor 5

(7) B32B Hybrid/EV Battery Temperature Sensor 2

(8) B32D Hybrid/EV Battery Temperature Sensor 4

(9) B32C Hybrid/EV Battery Temperature Sensor 3

(10) K16 Battery Energy Control Module

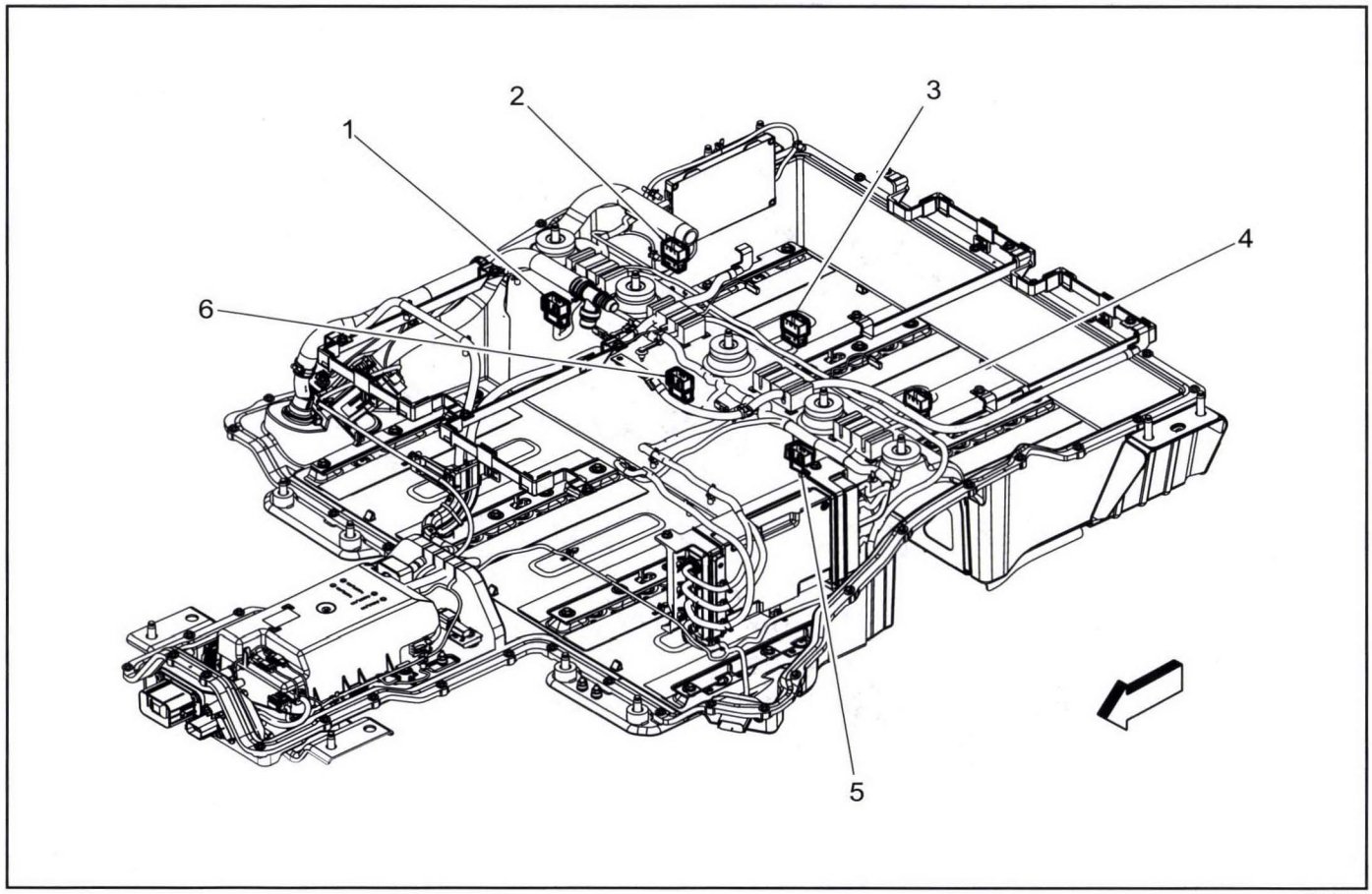
(11) R35 Manual Service Disconnect Resistor

(12) B30 Hybrid/EV Battery Pack Current Sensor

(13) E54 Hybrid/EV Battery Pack Coolant Heater

(14) B204A Hybrid/EV Battery Pack Coolant Temperature Sensor 1

Underbody - Hybrid/EV Battery Pack Components (3 of 3)

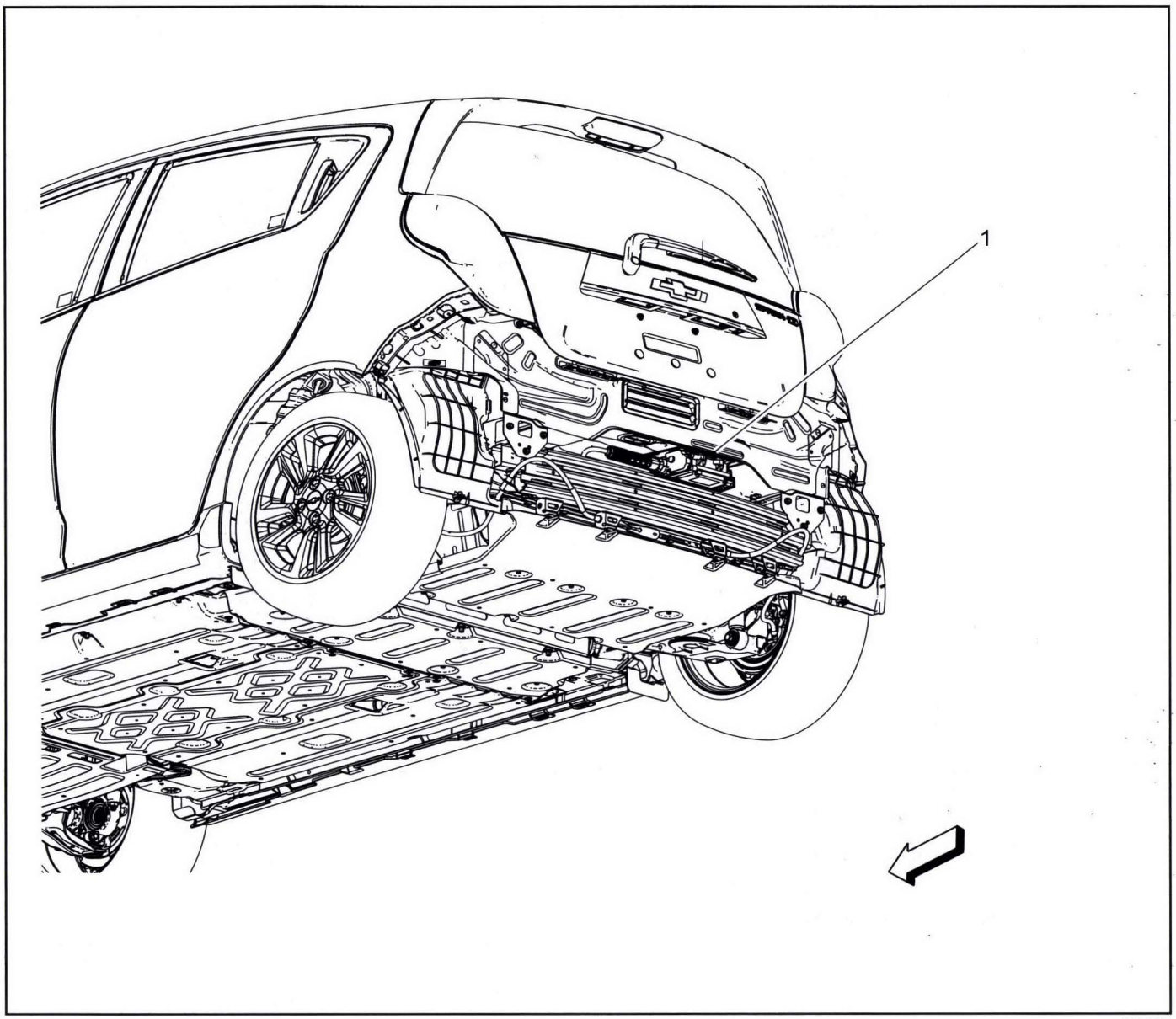


3968961

Items

(1) C4A Hybrid/EV Battery Section 1
(2) C4F
(3) C4E
(4) C4D
(5) C4C Hybrid/EV Battery Section 3
(6) C4B Hybrid/EV Battery Section 2

Underbody - Park Brake Components

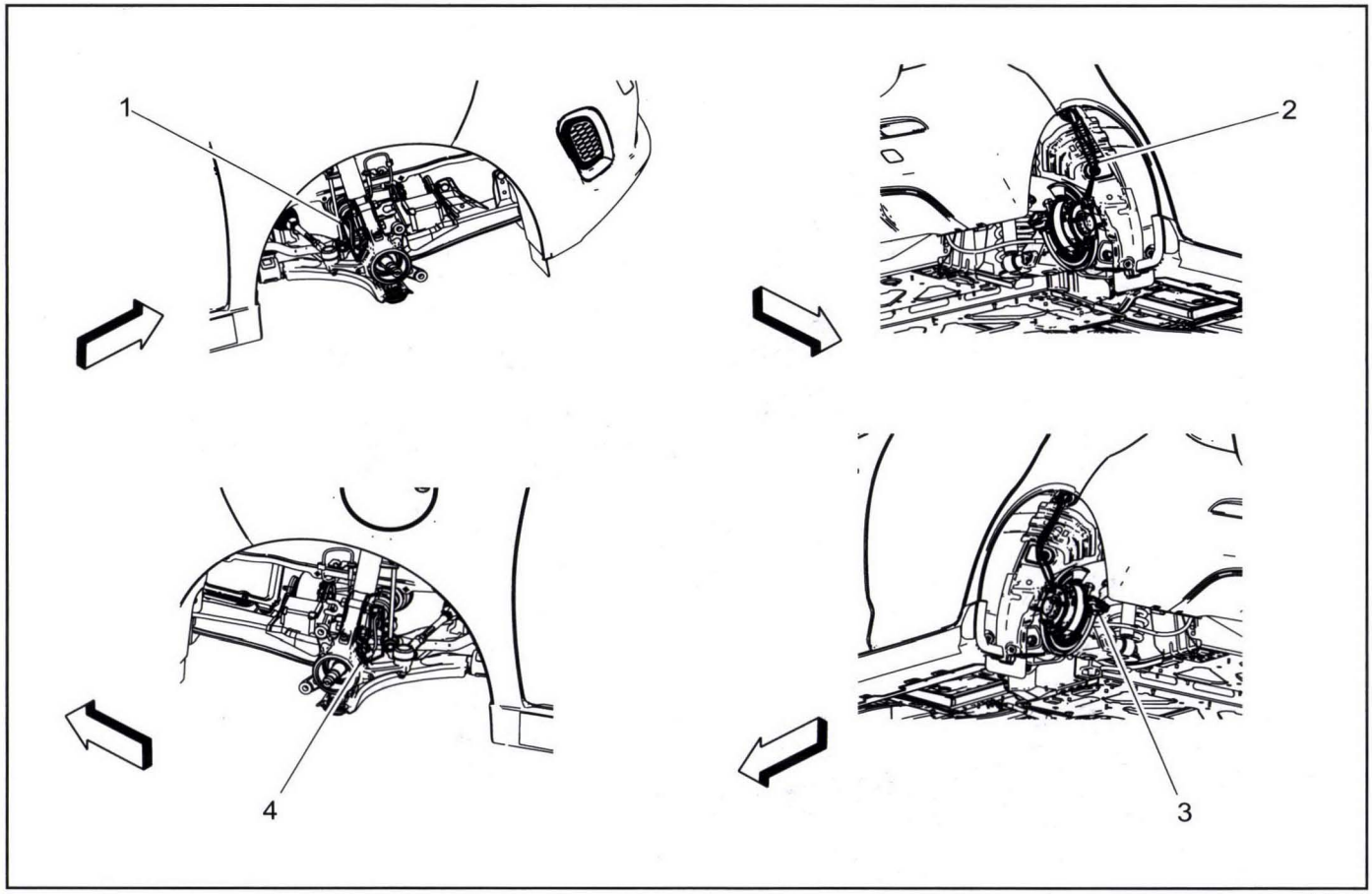


3216391

Items

(1) K83 Park Brake Control Module

Underbody - Wheel Components

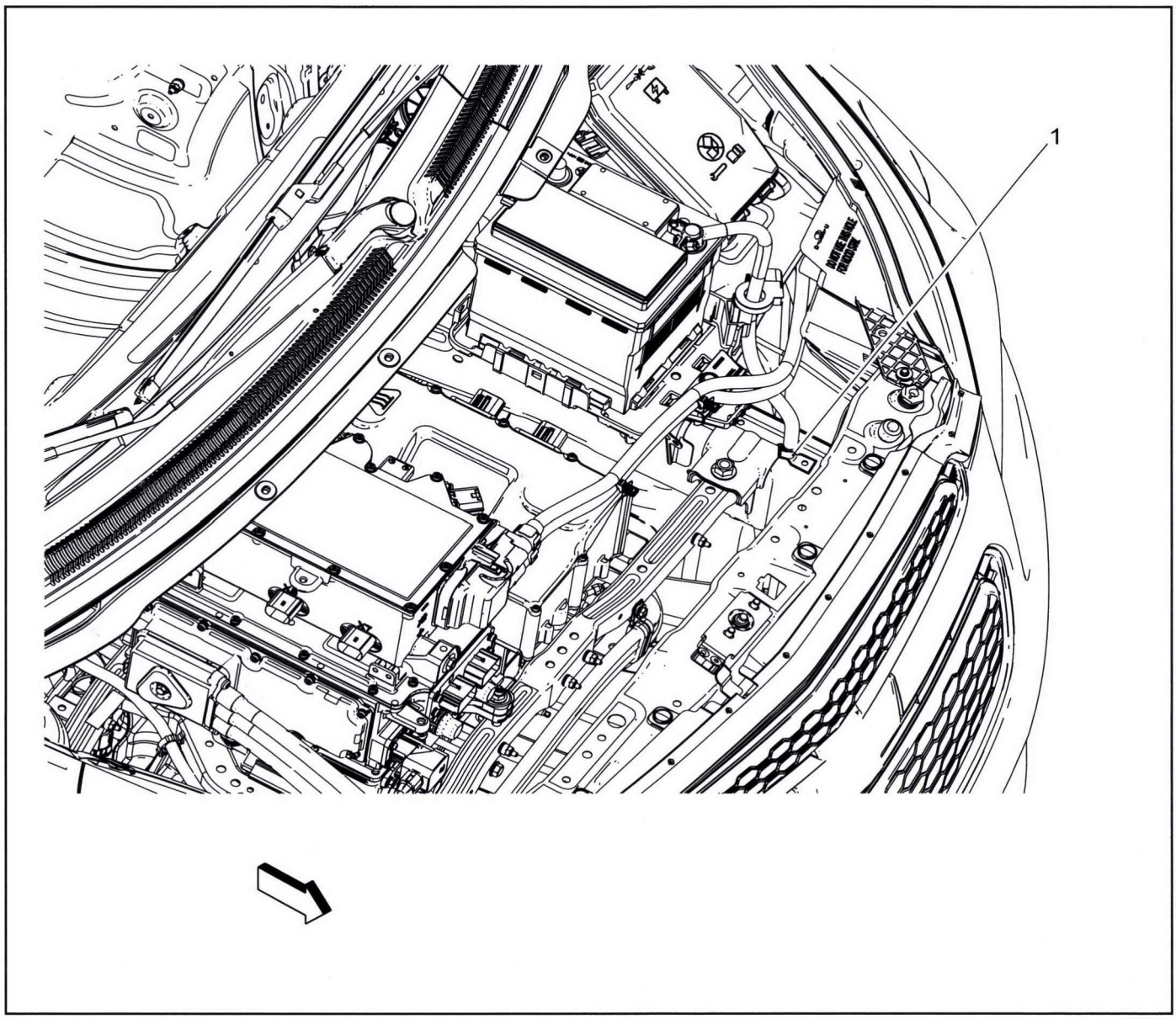


3216393

Items

(1) B5RF Wheel Speed Sensor - Right Front
(2) B5RR Wheel Speed Sensor - Right Rear
(3) B5LR Wheel Speed Sensor - Left Rear
(4) B5LF Wheel Speed Sensor - Left Front

Ground Views
G100

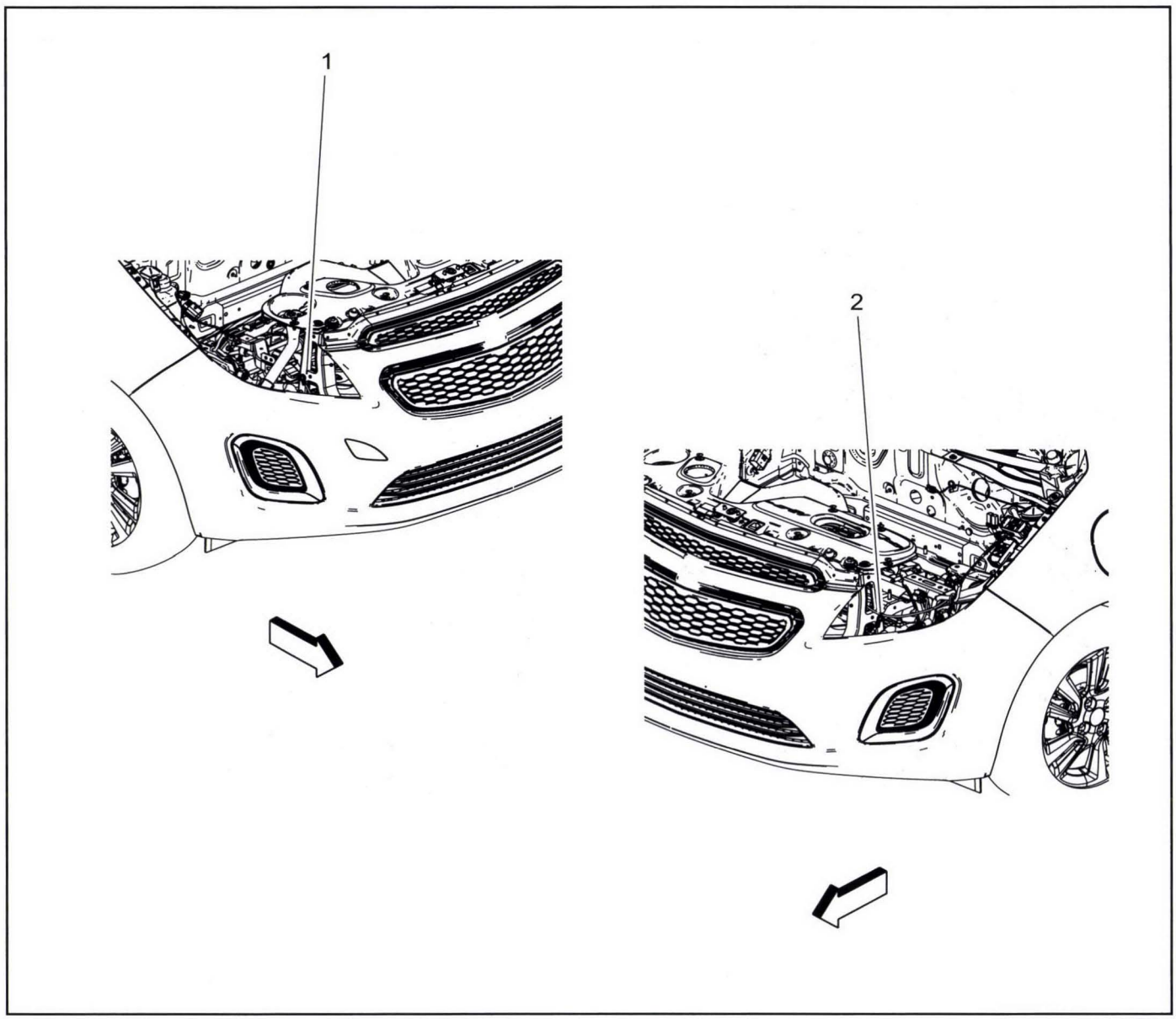


3220475

Items

(1) G100

G101 and G102

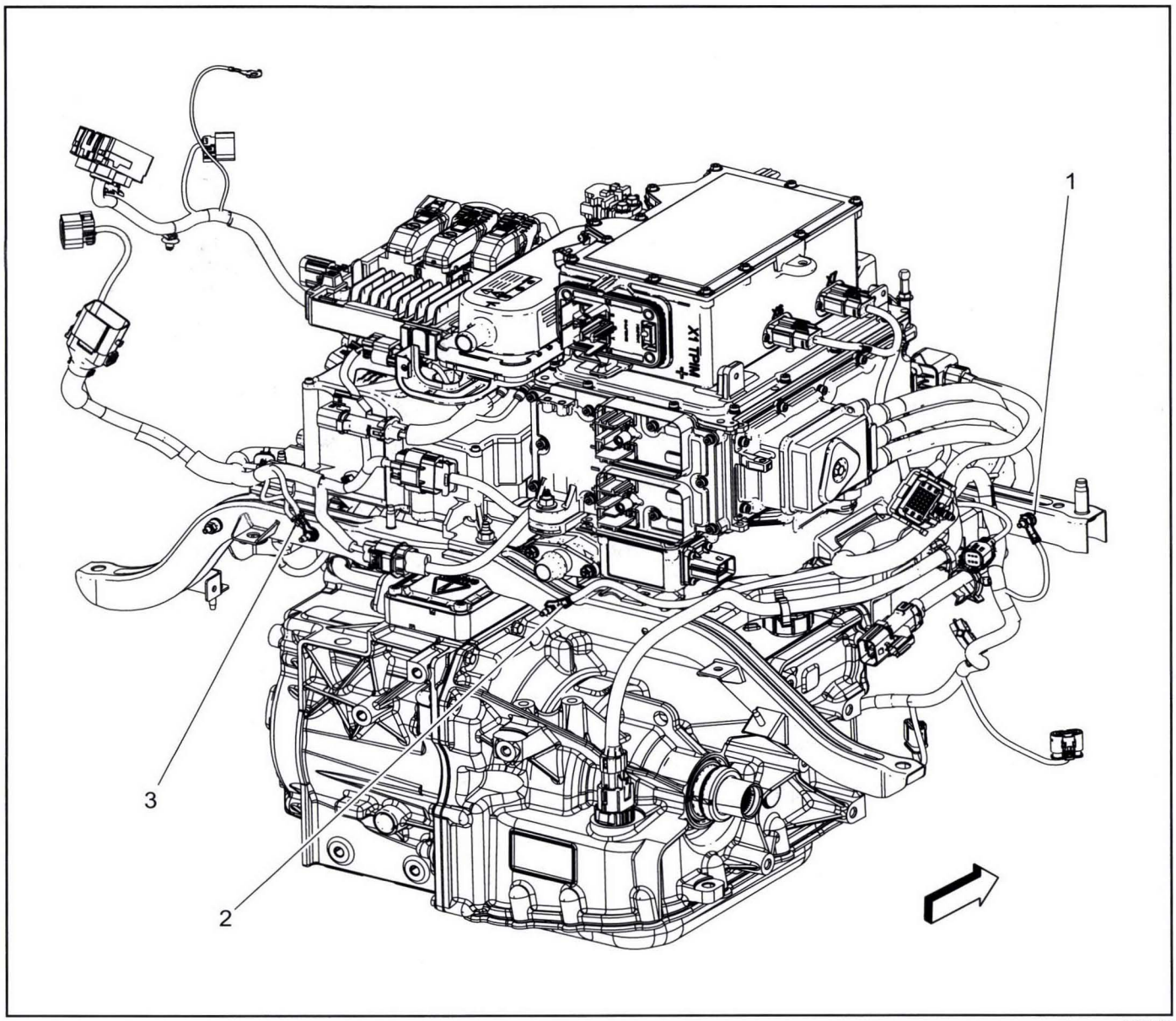


3220489

Items

(1) G102
(2) G101

G103, G105 and G106

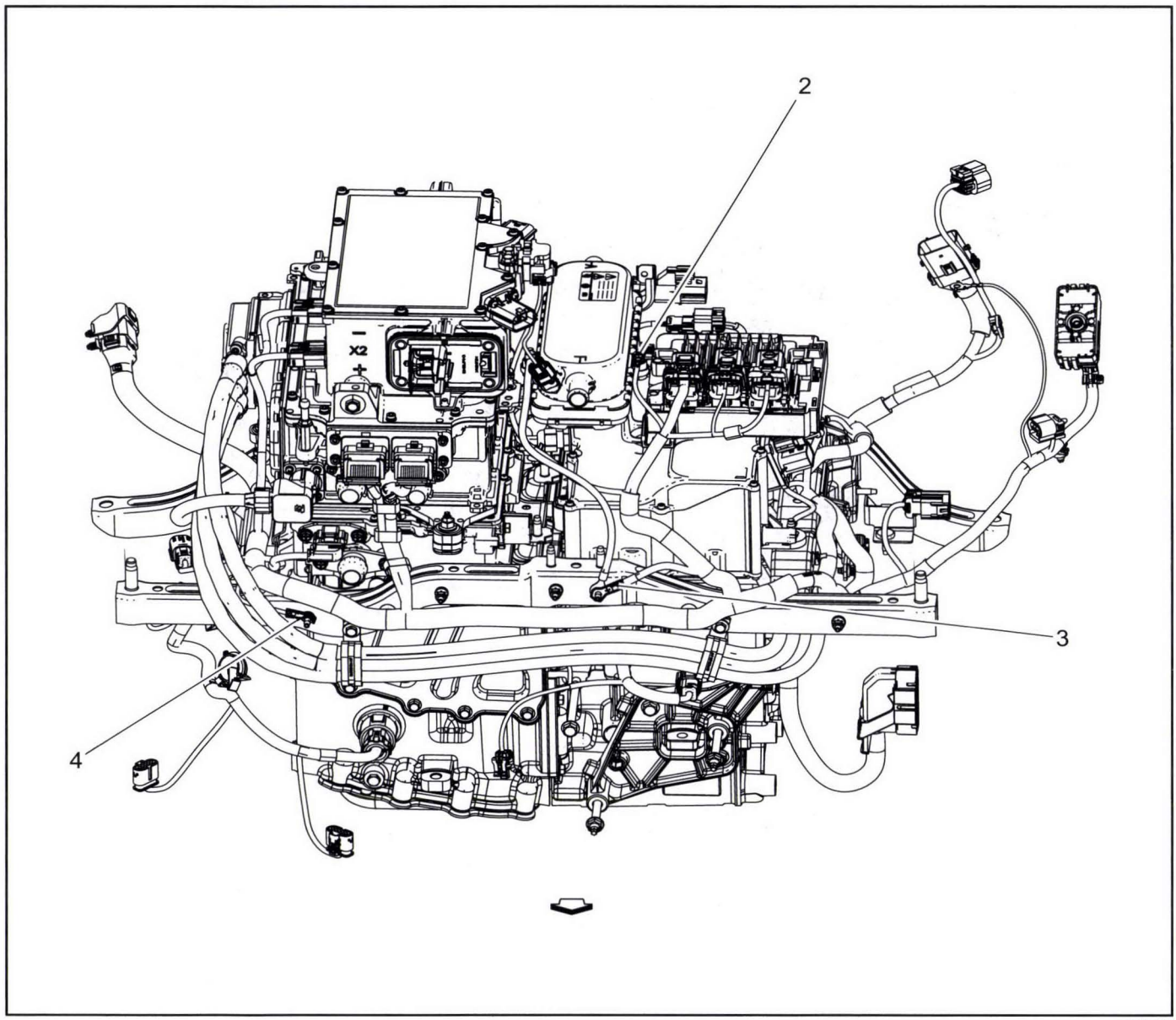


3220494

Items

(1) G105
(2) G103
(3) G106

G104, G110 and G112

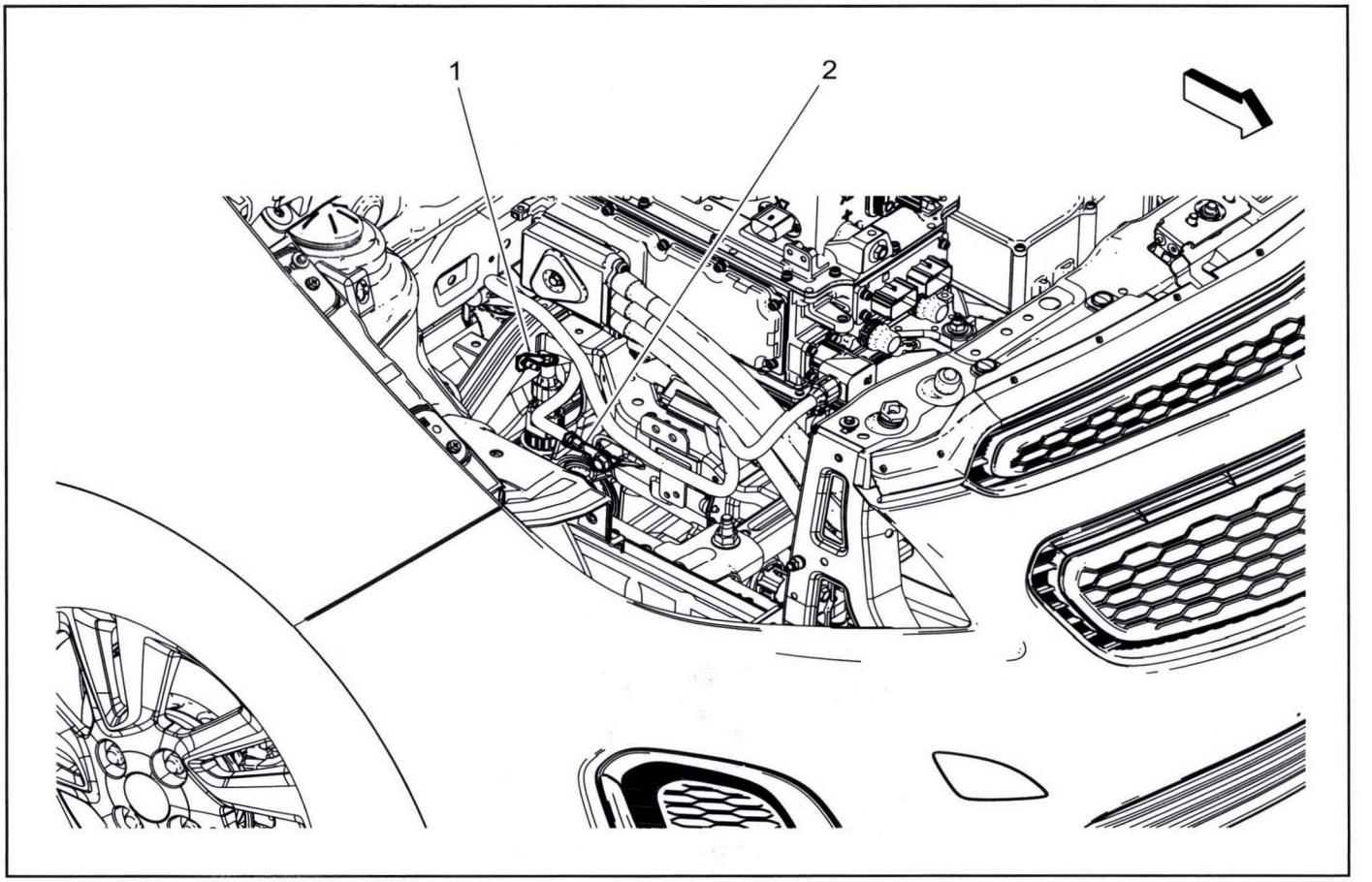


3220496

Items

(2) G112
(3) G110
(4) G104

G151 and G152

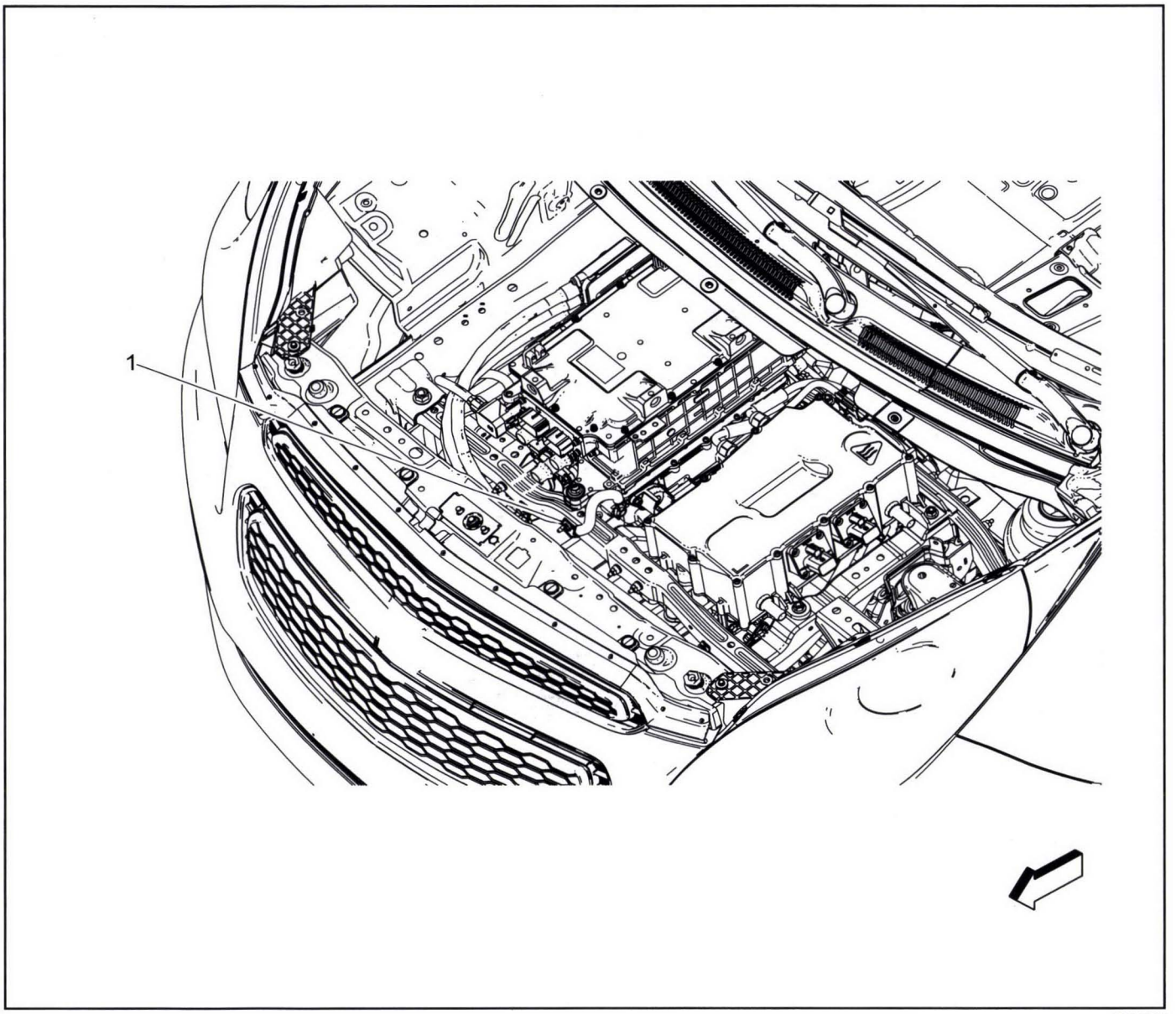


3220501

Items

(1) G151
(2) G152

G153 and G154

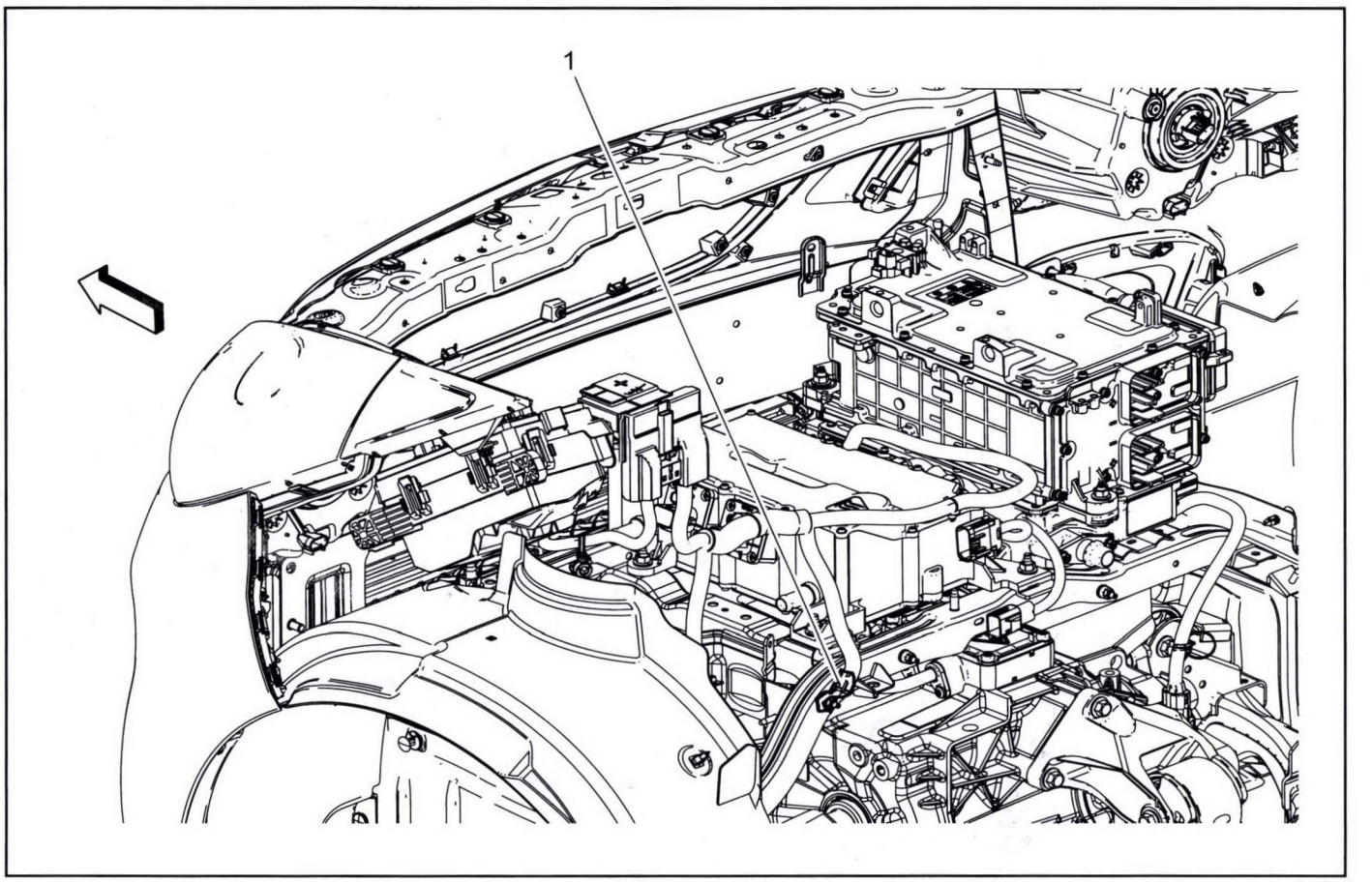


3220508

Items

(1) G153

G155

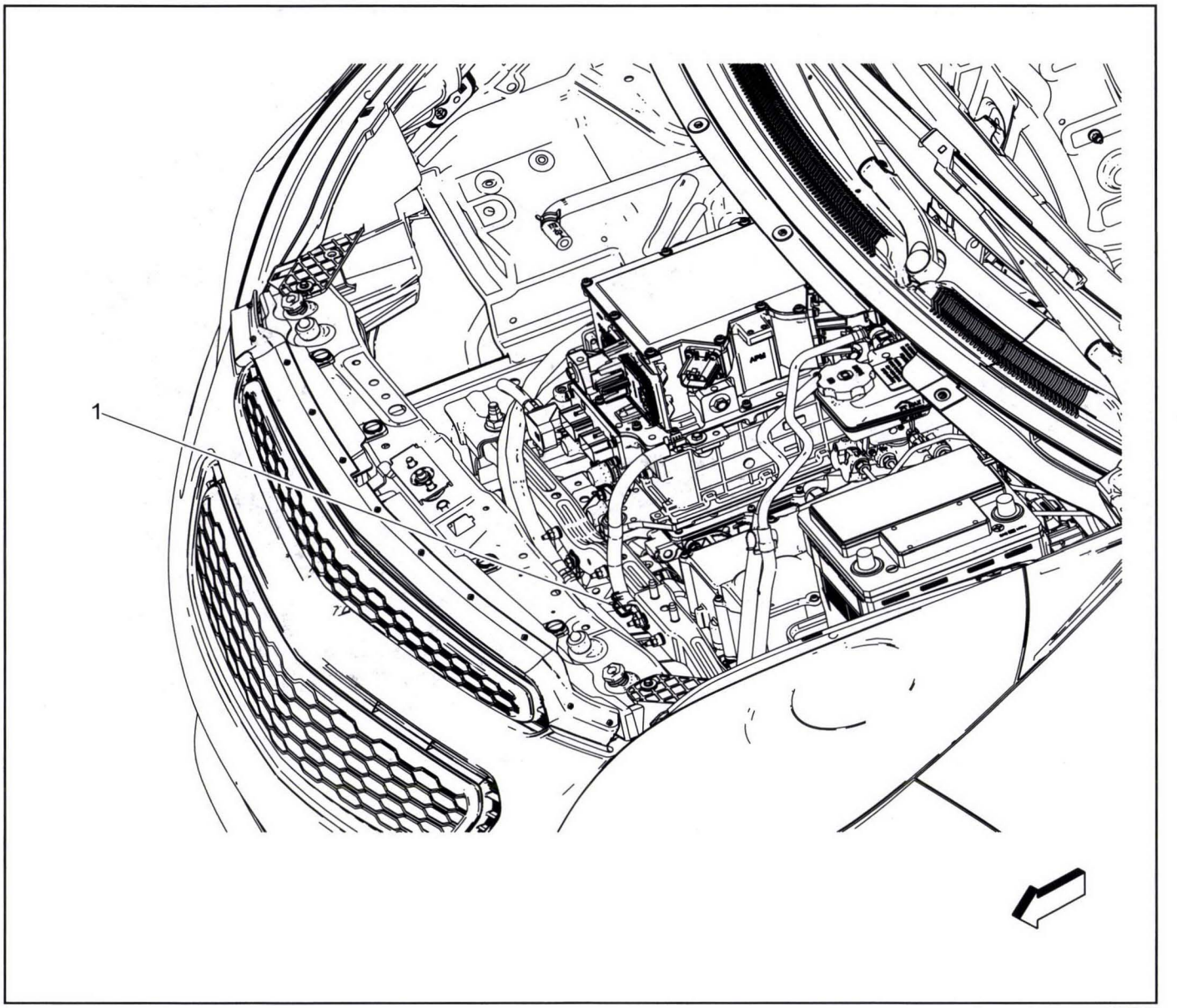


3220511

Items

(1) G155

G160 and G161

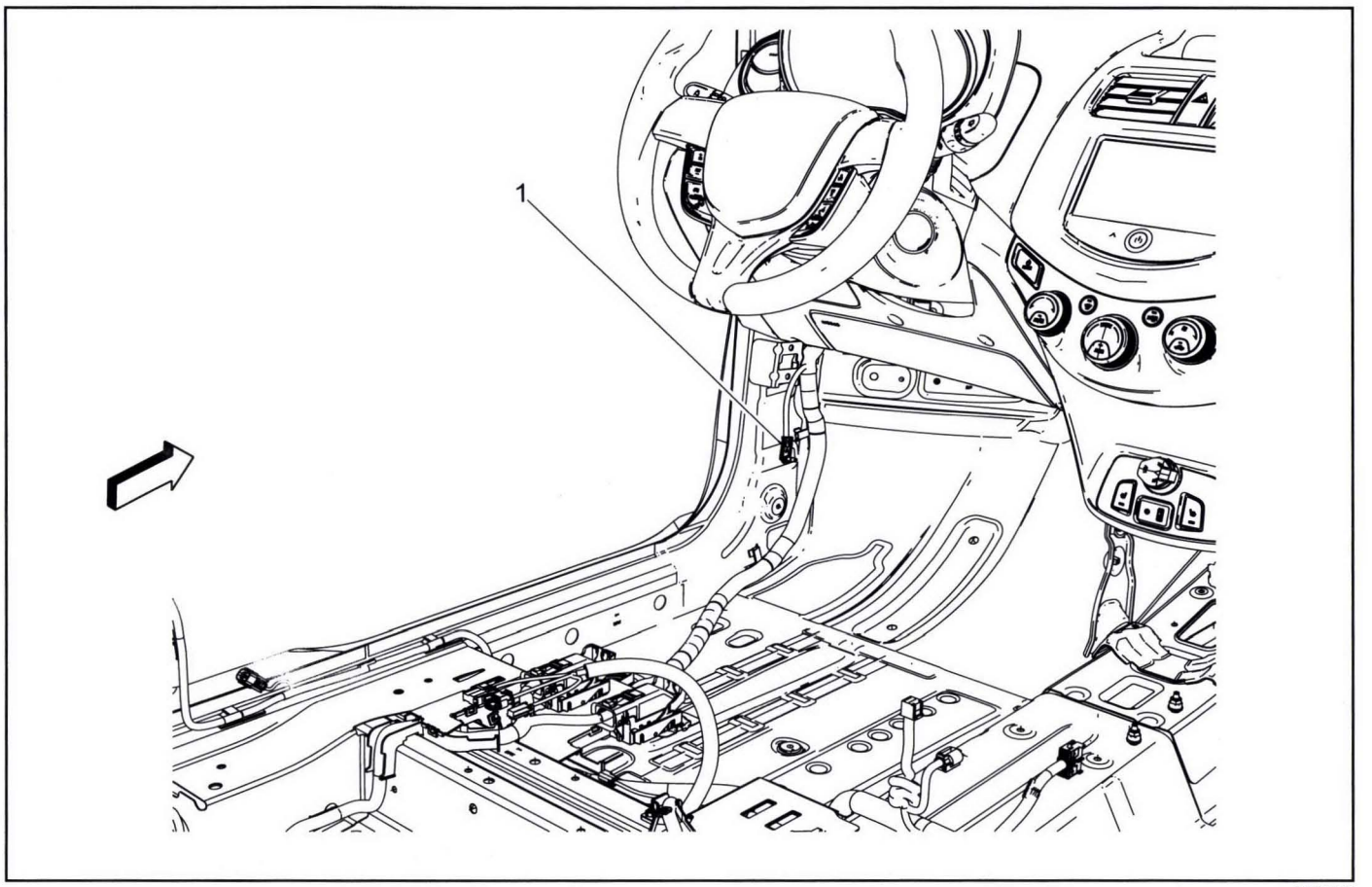


3285118

Items

(1) G160

G201

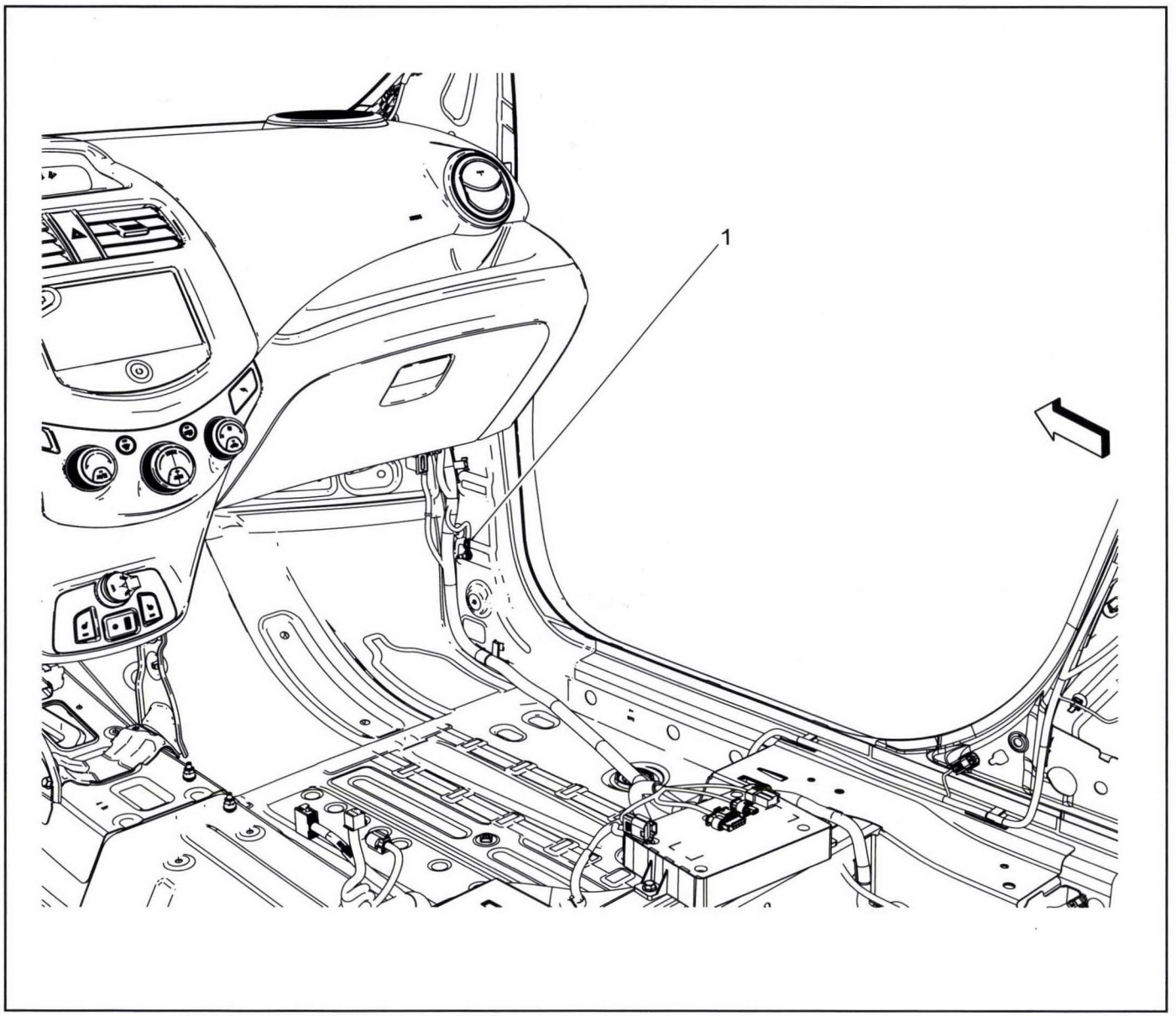


3285120

Items

(1) G201

G202

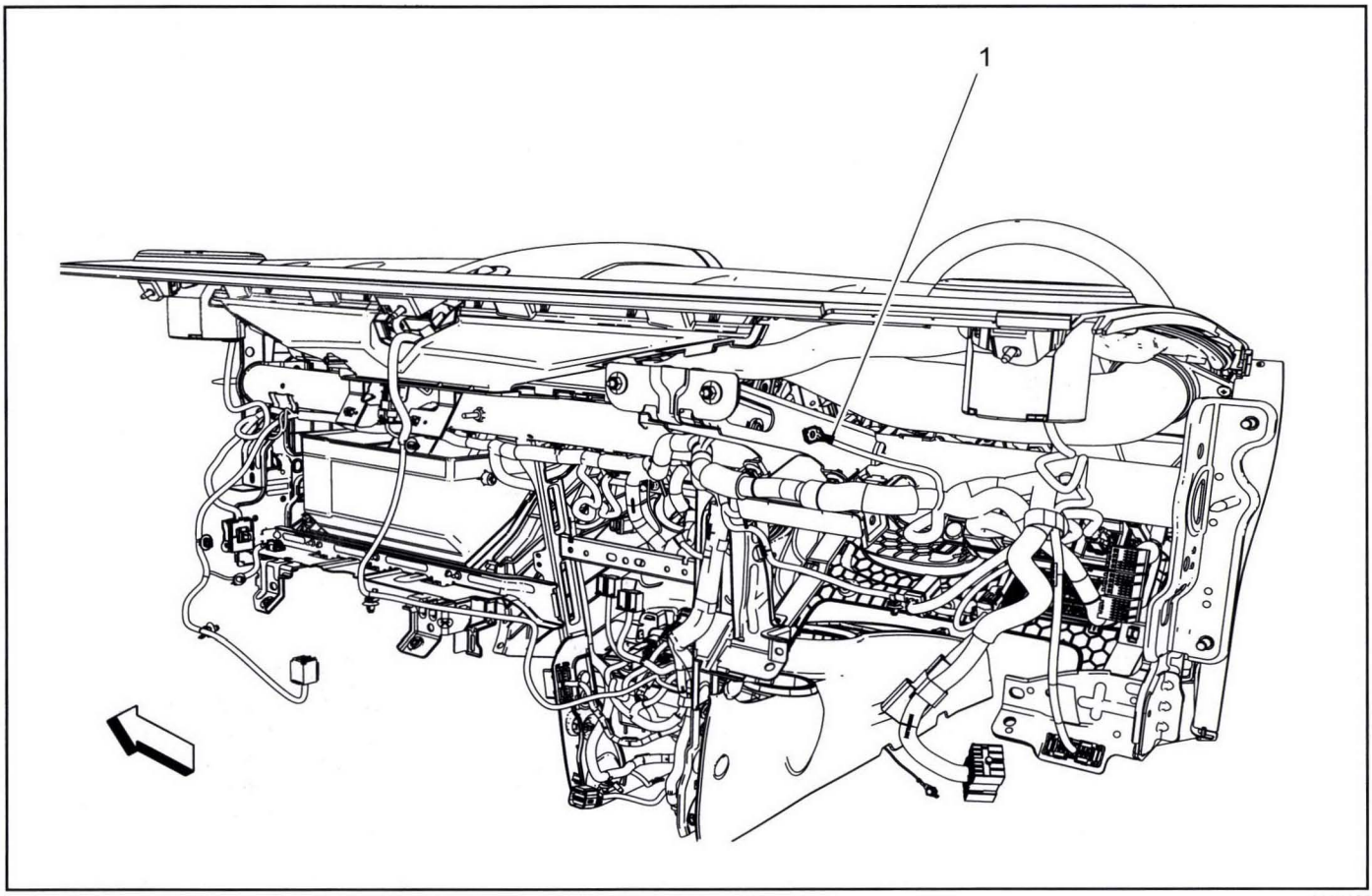


3285122

Items

(1) G202

G210

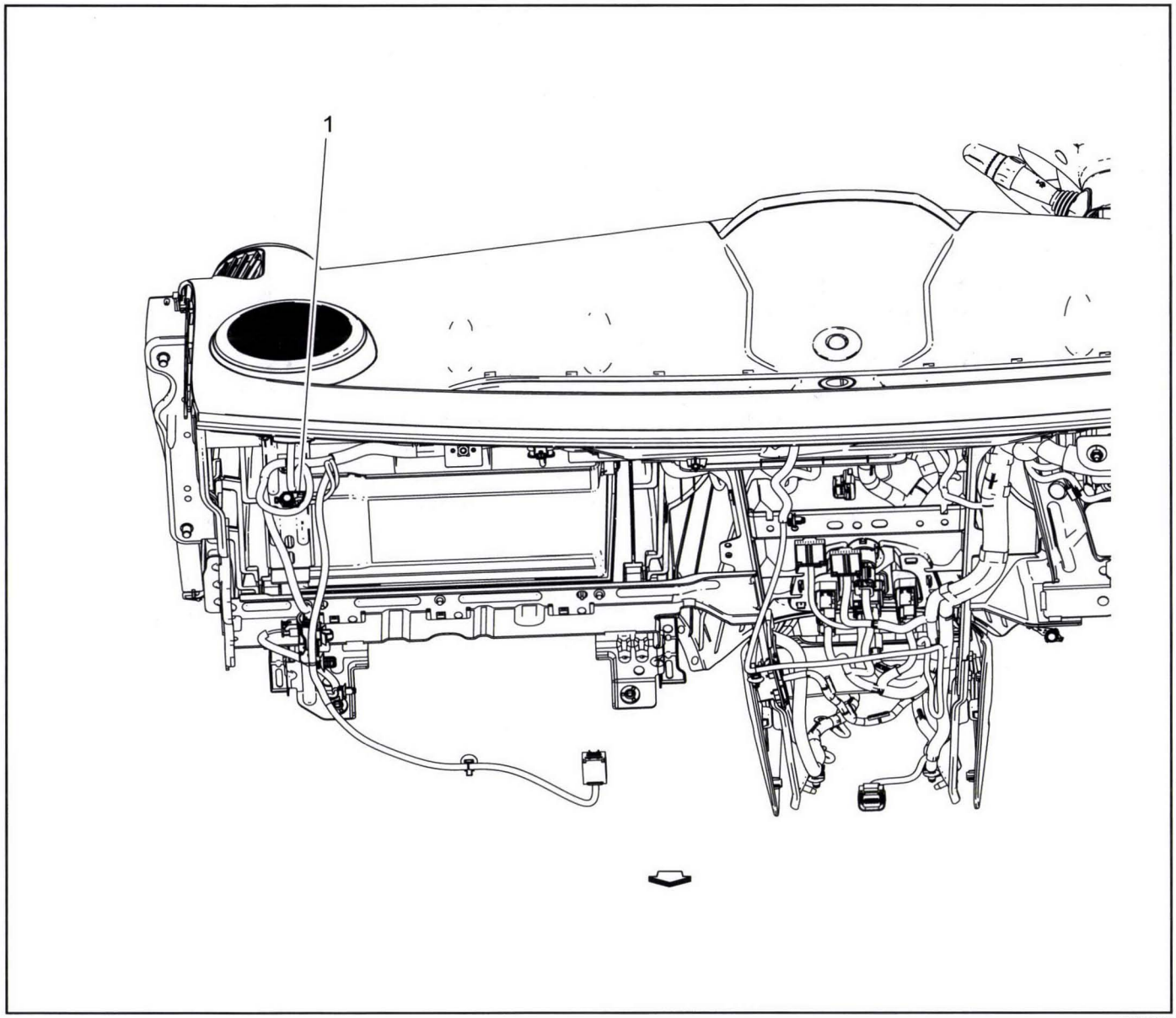


3285125

Items

(1) G210

G211

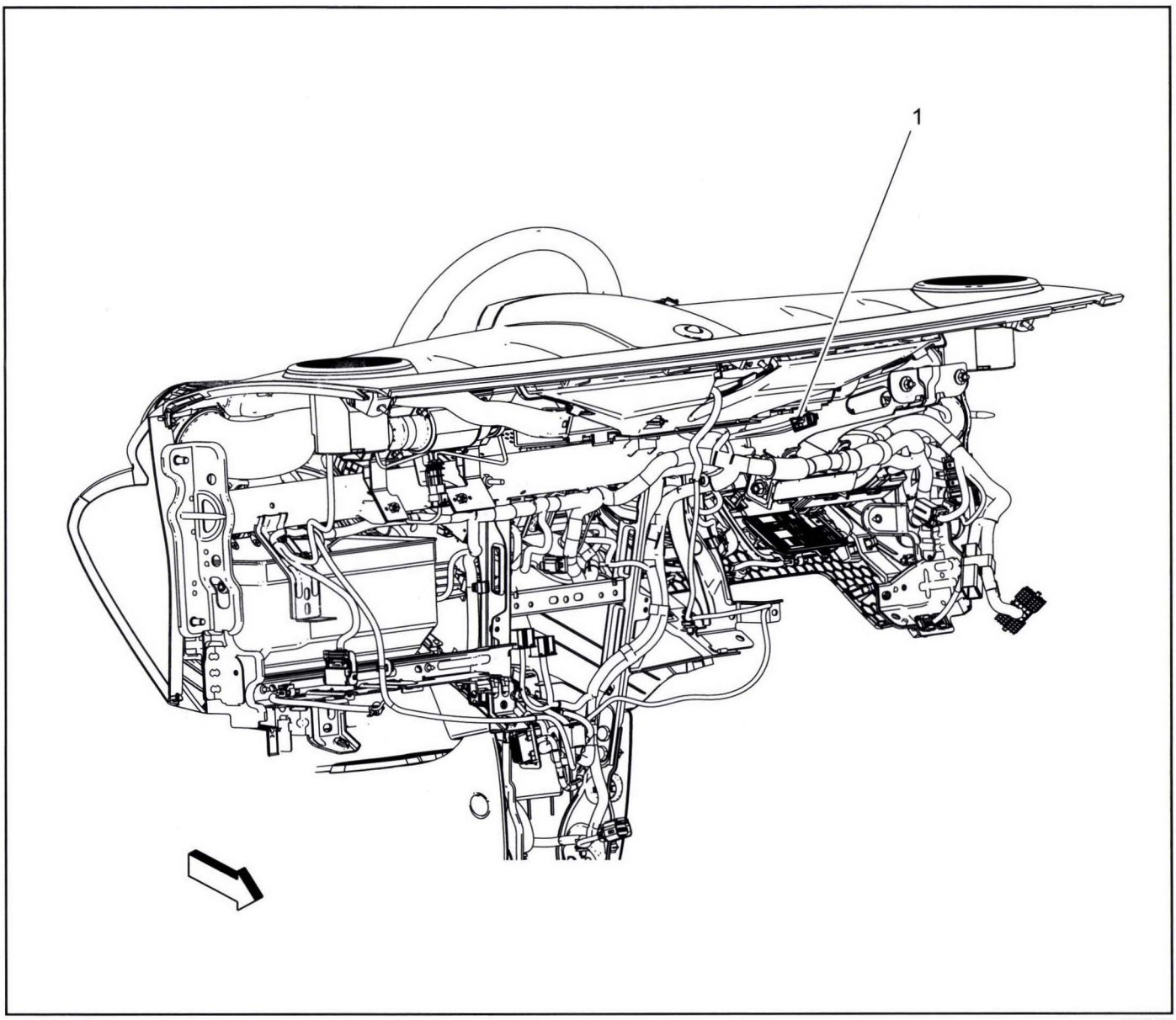


3285127

Items

(1) G211

G213

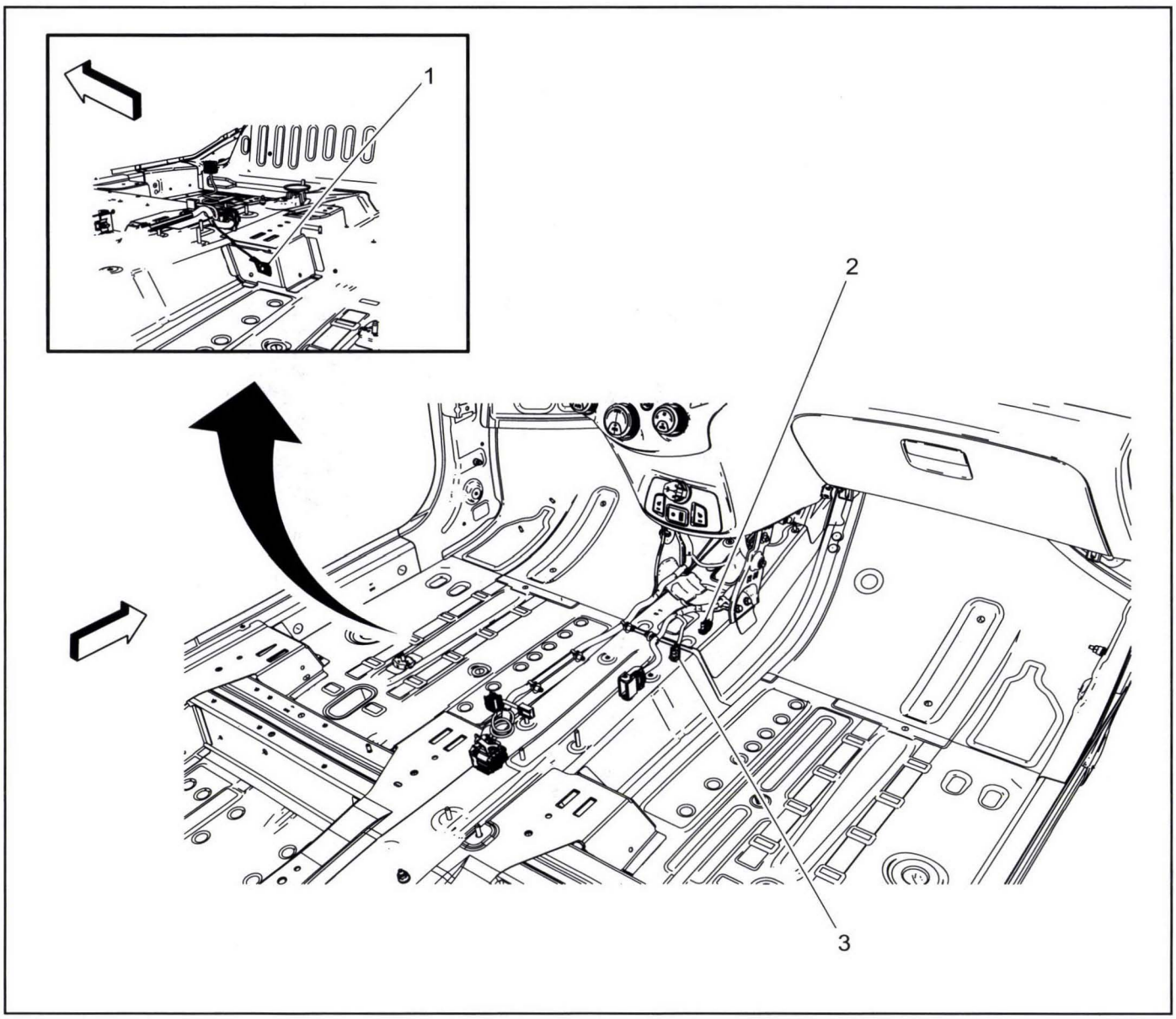


3285129

Items

(1) G213

G214, G215 and G305

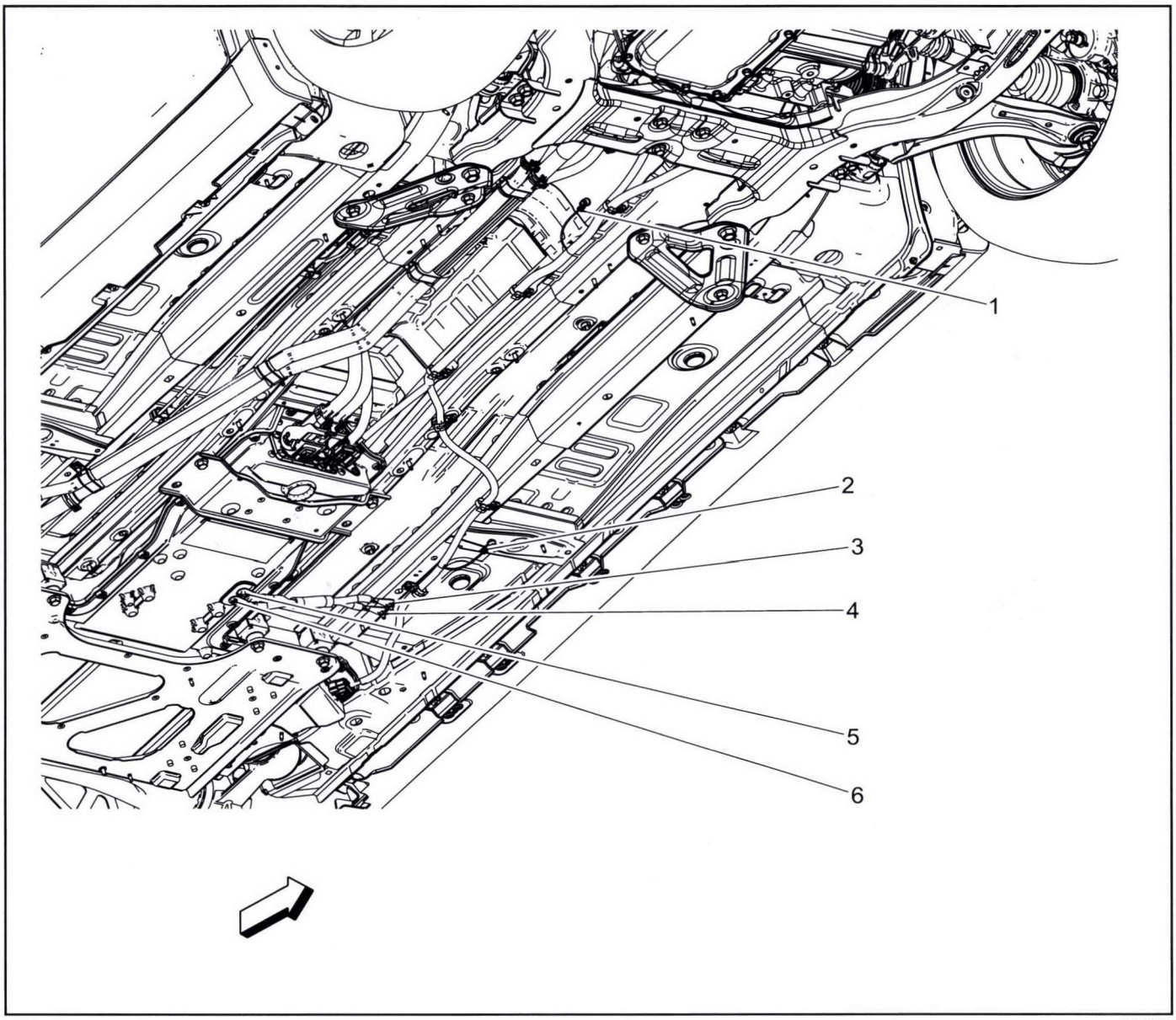


3285131

Items

(1) G305
(2) G215
(3) G214

G259, G354, G355, G356, G357 and G358

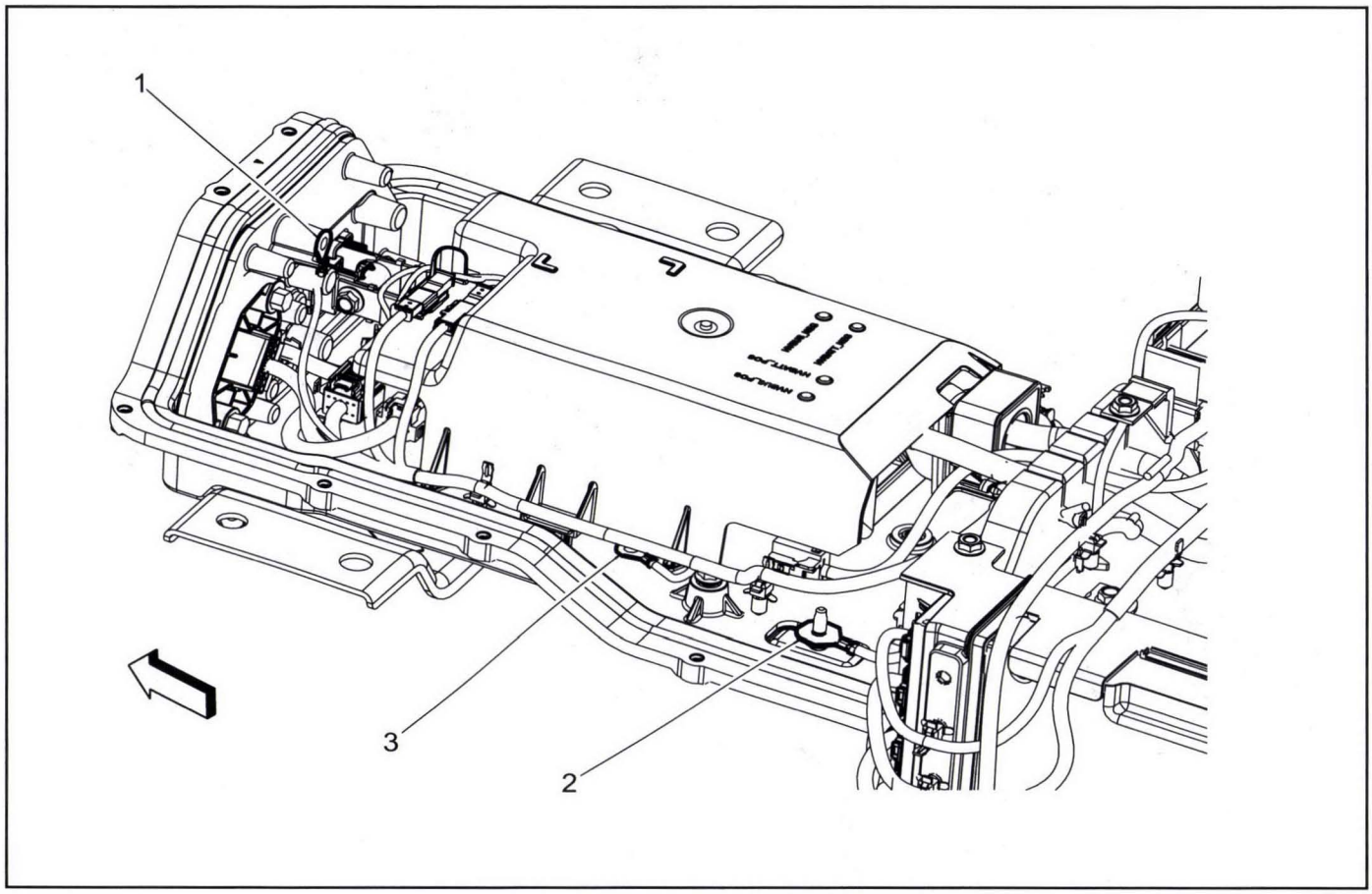


3285133

Items

(1) G259
(2) G354
(3) G355
(4) G358
(5) G356
(6) G357

G350, G351, G352

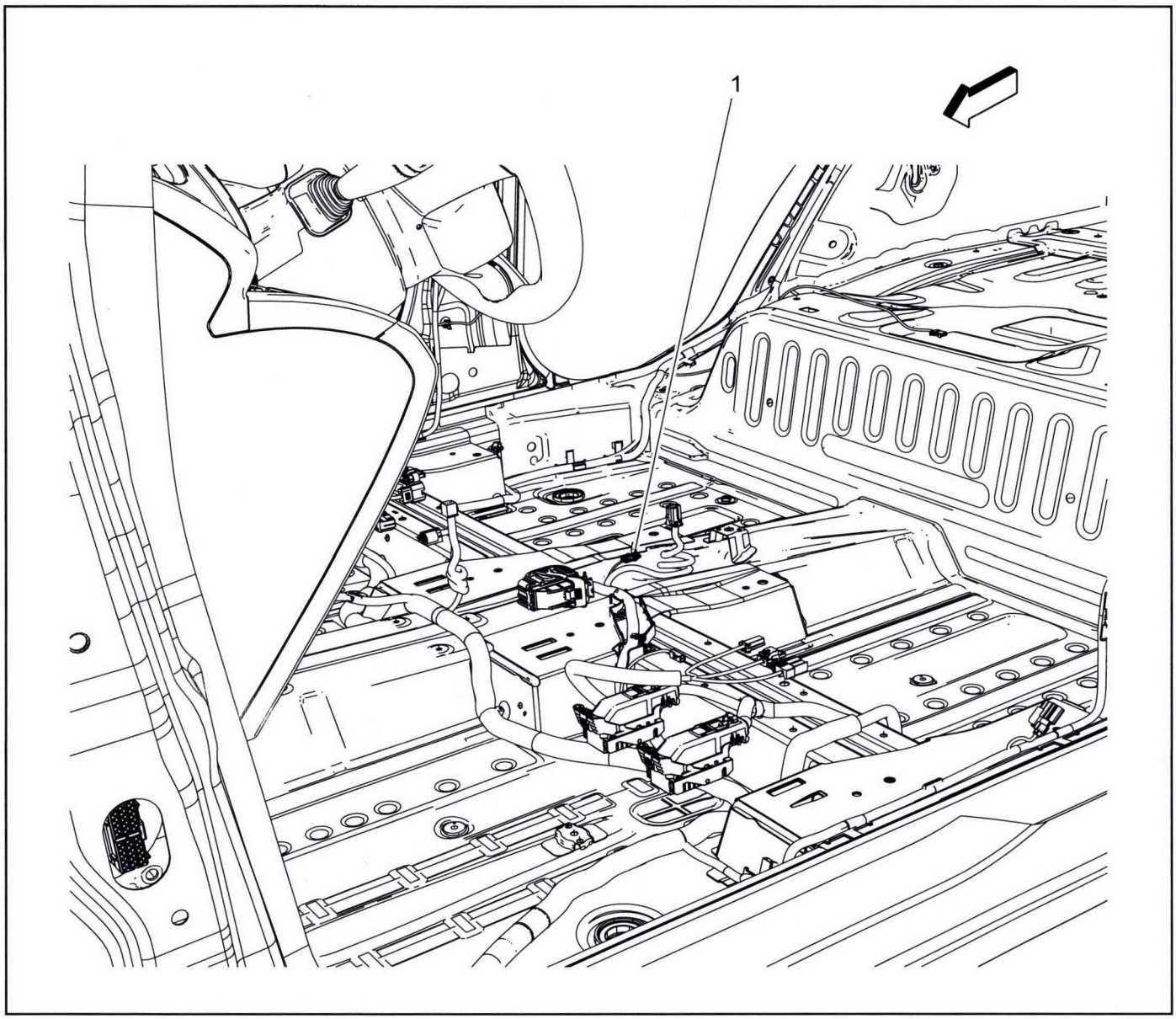


3967977

Items

(1) G352
(2) G350
(3) G351

G303

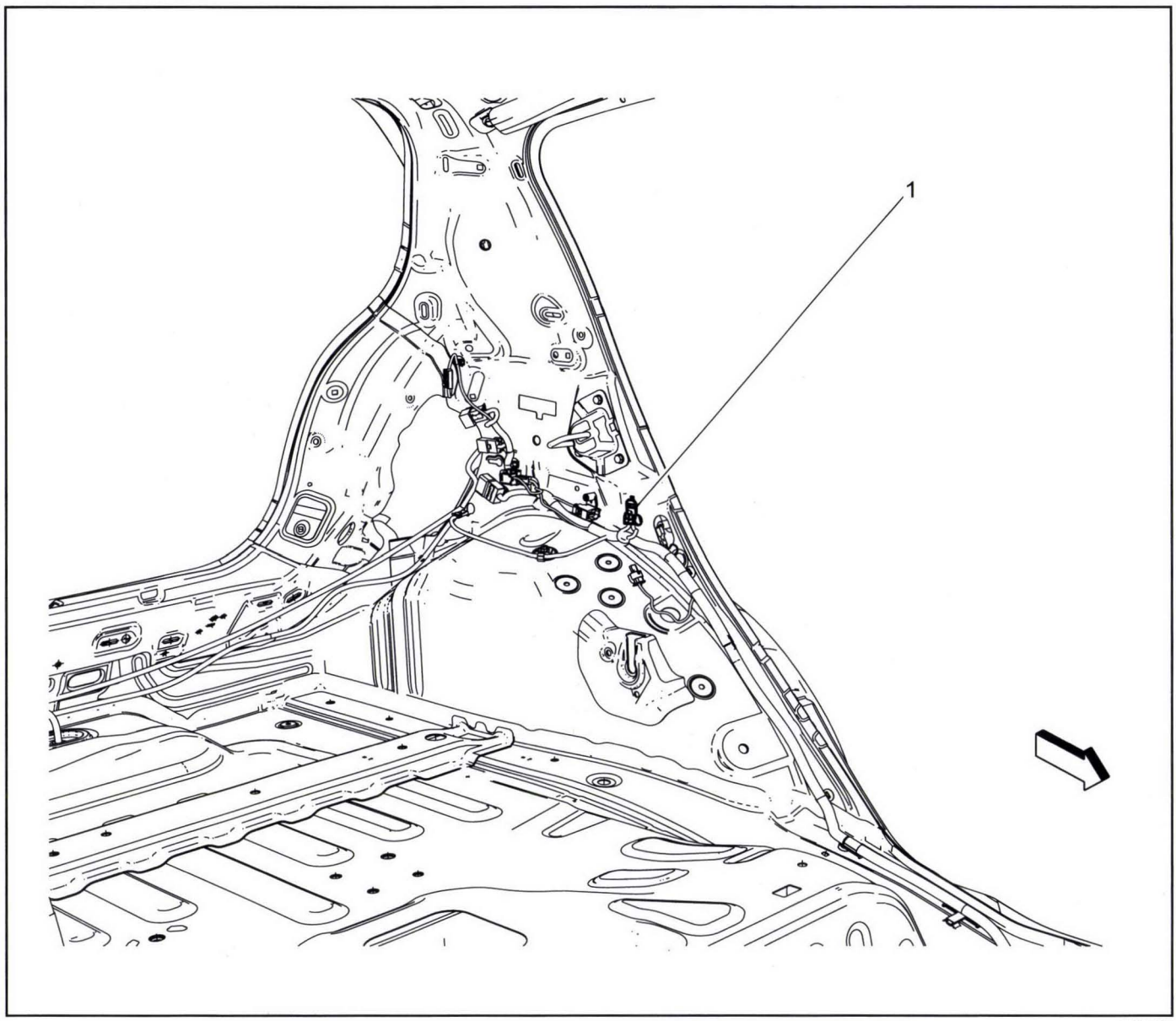


3285135

Items

(1) G303

G310

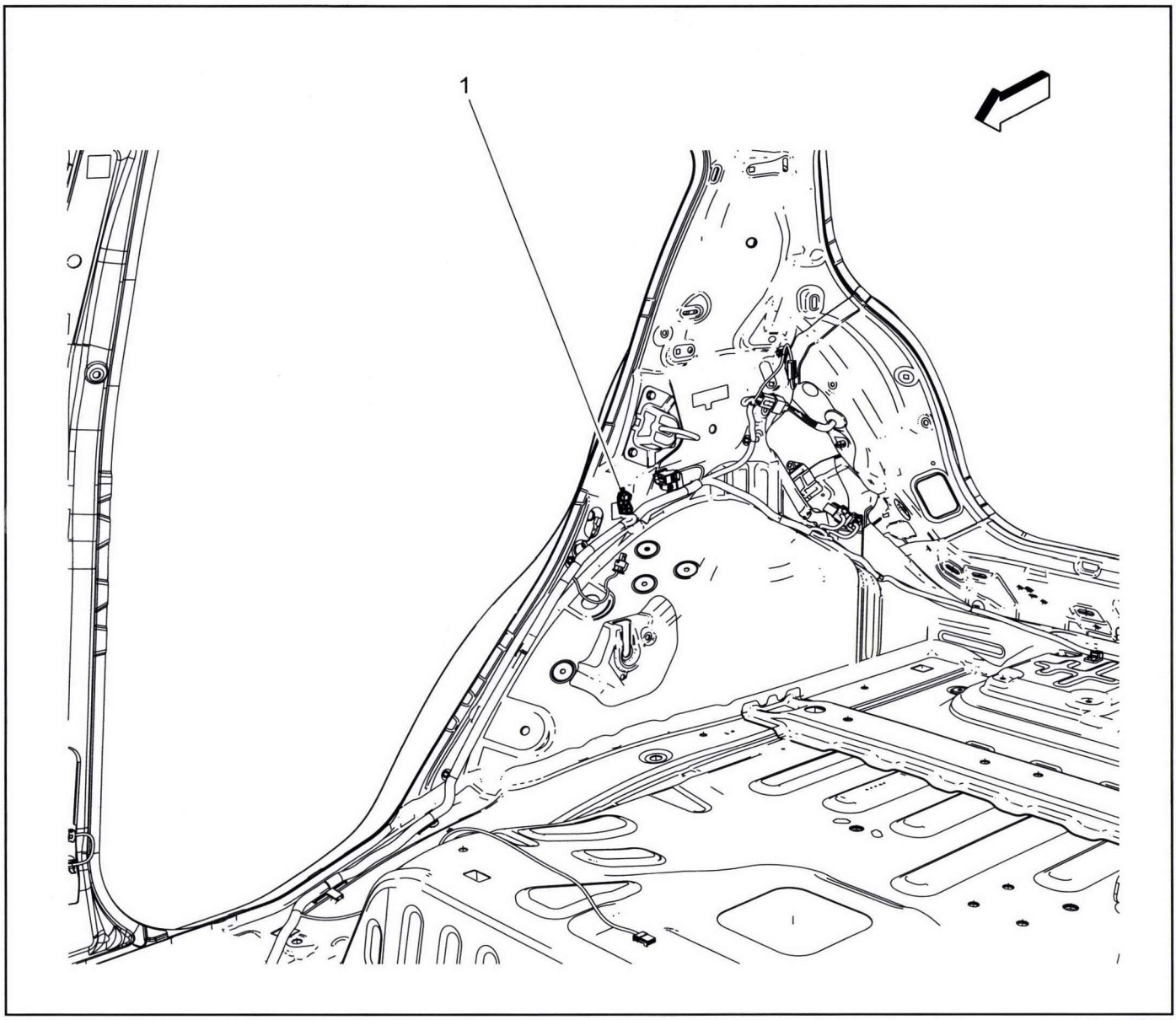


3285137

Items

(1) G310

G311



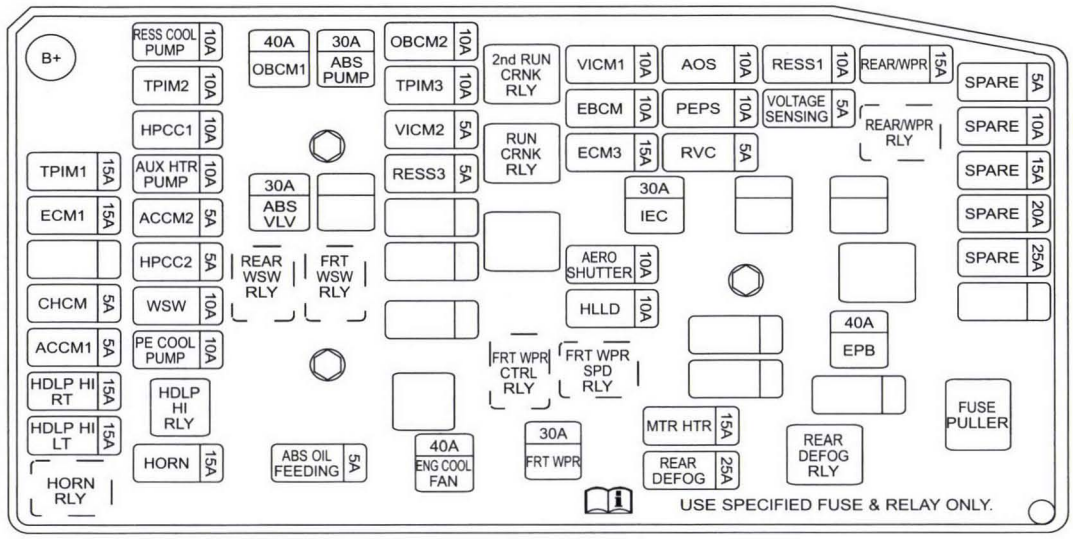
3285139

Items

(1) G311

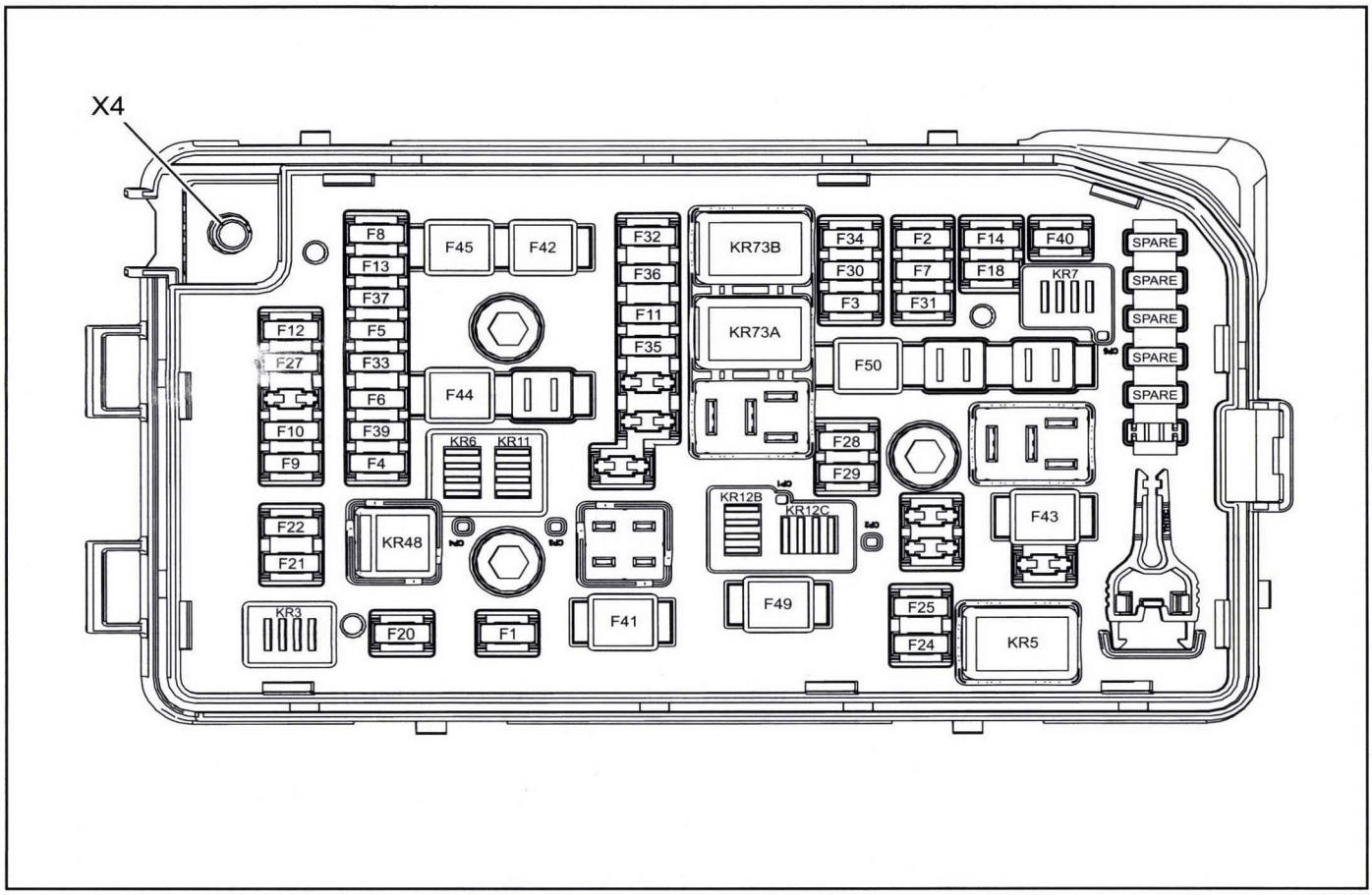
Electrical Center Identification Views

X50A Fuse Block - Underhood Label



3221718

X50A Fuse Block - Underhood Top View



3221720

X50A Fuse Block – Underhood Usage

Device Label Name	Device Assigned Name	Rating	Description
Fuses			
ABS OIL FEEDING	F1UA	5A	X90 Assembly Plant ABS Data Connector
AOS	F2UA	10A	B60 Passenger Presence Sensor
ECM	F3UA	15A	K20 Engine Control Module
PE COOL PUMP	F4UA	10A	G35 Hybrid/EV Electronics Coolant Pump
AUX HTR PUMP	F5UA	10A	G36 Auxiliary Heater Coolant Pump
HPCC	F6UA	5A	T24 Battery Charger – DC
PEPS	F7UA	10A	K84 Keyless Entry Control Module
RESS COOL PUMP	F8UA	10A	G37 Hybrid/EV Battery Pack Coolant Pump
ACCM	F9UA	5A	G1 A/C Compressor
CHCM	F10UA	5A	K10 Coolant Heater Control Module
VICM	F11UA	5A	K114B Hybrid/EV Powertrain Control Module 2
TPIM1	F12UA	15A	T6 Power Inverter Module
TPIM2	F13UA	10A	T6 Power Inverter Module
RESS	F14UA	10A	K16 Battery Energy Control Module
—	F15UA	—	Not Used
—	F16UA	—	Not Used
—	F17UA	—	Not Used
VOLTAGE SENSING	F18UA	5A	K9 Body Control Module

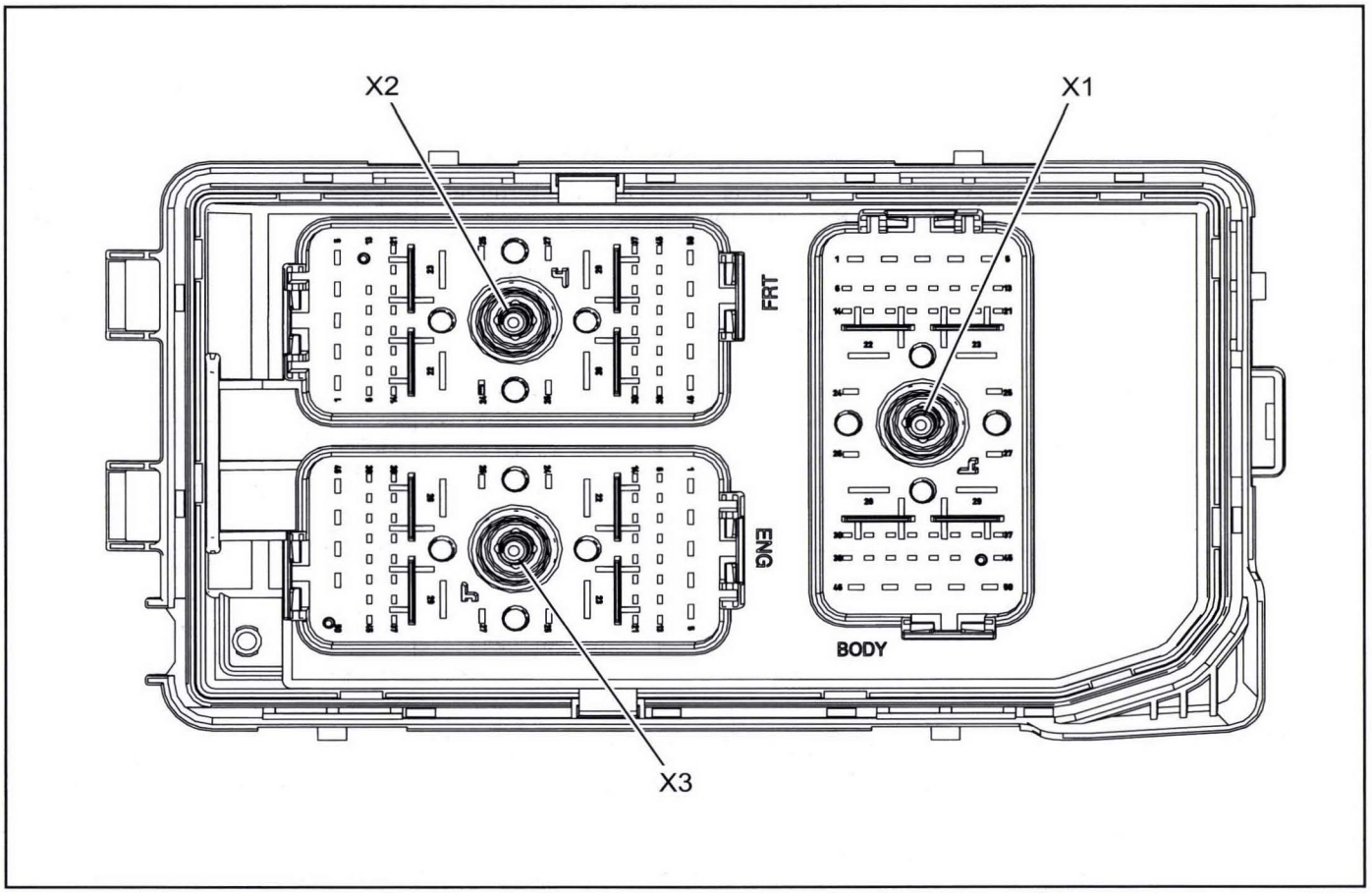
X50A Fuse Block – Underhood Usage (cont'd)

Device Label Name	Device Assigned Name	Rating	Description
—	F19UA	—	Not Used
HORN	F20UA	15A	P12 Horn
HDLP HI LT	F21UA	15A	E13L Headlamp — Left
HDLP HI RT	F22UA	15A	E13R Headlamp — Right
—	F23UA	—	Not Used
REAR DEFOG	F24UA	25A	E18 Rear Defogger Grid
MTR HTR	F25UA	10A	A9A Outside Rearview Mirror - Driver, A9Outside Rearview Mirror - Passenger
—	F26UA	—	Not Used
ECM	F27UA	15A	K20 Engine Control Module
AERO SHUTTER	F28UA	10A	M96 Active Grille Air Shutter Actuator
HLLD	F29UA	10A	E13LA Headlamp Assembly - Left, E13RA Headlamp Assembly - Right
EBCM	F30UA	10A	K17 Electronic Brake Control Module
RVC	F31UA	5A	B87 Rearview Camera
OBCM	F32UA	10A	T18 Battery Charger
ACCM	F33UA	5A	G1 A/C Compressor
VICM	F34UA	10A	K114B Hybrid/EV Powertrain Control Module 2
RESS	F35UA	5A	K16 Battery Energy Control Module
TPIM	F36UA	10A	T6 Power Inverter Module
HPCC	F37UA	10A	T24 Battery Charger – DC
—	F38UA	—	Not Used
WSW	F39UA	10A	KR11 Windshield Washer Pump Relay, KR6 Rear Window Washer Pump Relay, G19 Rear Window Washer Pump, G24 Windshield Washer Pump
REAR/WPR	F40UA	15A	KR7 Rear Wiper Relay, M45 Rear Wiper Motor
ENG COOL FAN	F41UA	40A	G10 Cooling Fan Motor
ABS PUMP	F42UA	50A	K17 Electronic Brake Control Module
EBP	F43UA	40A	K83 Parking Brake Control Module
ABS VLV	F44UA	30A	K17 Electronic Brake Control Module
OBCM	F45UA	40A	T18 Battery Charger
—	F46UA	—	Not Used
—	F47UA	—	Not Used
—	F48UA	—	Not Used
FRT WPR	F49UA	30A	M75 Windshield Wiper Motor
HPPC	F50UA	30A	T24 Battery Charger – DC
Relays			
REAR DEFOG RLY	KR5 Rear Defogger Relay	—	F16UA, F17UA
HDLP HI RLY	KR48 Headlamp High Beam Relay	—	F21UA, F22UA
RUN CRNK RLY	KR73A Ignition Main Relay 1	—	F27UA, F29UA, F30UA, F31UA, F36UA
2ND RUN CRNK RLY	KR73B Ignition Main Relay 2	—	F32UA, F33UA, F34UA, F35UA, F36UA, F37UA
Note: Items listed below are diagnostic test points for PCB relays			
HORN RLY	KR3 Horn Relay	—	F20UA

X50A Fuse Block – Underhood Usage (cont'd)

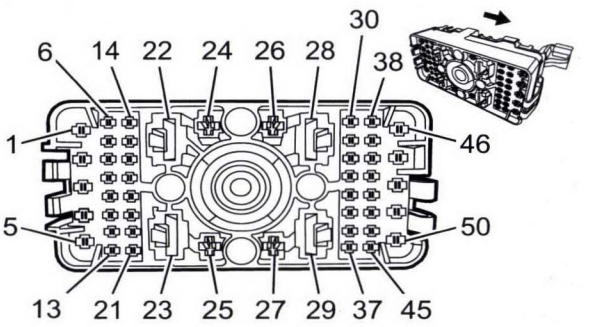
Device Label Name	Device Assigned Name	Rating	Description
RR WSW RLY	KR6 Rear Window Washer Pump Relay	—	G19 Rear Window Washer Pump
REAR/WPR RLY	KR7 Rear Wiper Relay	—	M45 Rear Wiper Motor
FRT WSW RLY	KR11 Windshield Washer Pump Relay	—	G24 Windshield Washer Pump
FRT WPR CTRL RLY	KR12B Windshield Wiper Relay	—	M75 Windshield Wiper Motor
FRT WPR SPD RLY	KR12C Windshield Wiper Speed Control Relay	—	M75 Windshield Wiper Motor

X50A Fuse Block - Underhood Bottom View



3221724

X50A Fuse Block - Underhood X1



2220560

Connector Part Information

Harness Type: Body
OEM Connector: 13732282
Service Connector: 13505902
Description: 50-Way F 1.5, 2.8 DSQ Metri-Pack 800 Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575718	J-35616-44 (YE)	J-38125-558	12110127	2	F	G
II	13575718	J-35616-44 (YE)	J-38125-558	12110127	2	F	G
III	13327116	J-35616-35 (VT)	J-38125-36	Not Available	Not Available	Not Available	Not Available
IV	13575491	J-35616-35 (VT)	J-38125-36	Not Available	Not Available	Not Available	Not Available
V	13575773	J-35616-2A (GY)	J-38125-560	Not Available	Not Available	Not Available	Not Available
VI	13575774	J-35616-2A (GY)	J-38125-560	Not Available	Not Available	Not Available	Not Available
VII	13575780	J-35616-35 (VT)	J-38125-36	Not Available	Not Available	Not Available	Not Available

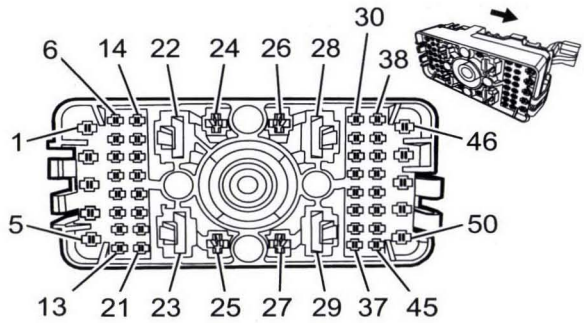
X50A Fuse Block - Underhood X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	2	BK	450	Ground	III	—
2	1	YE	712	Left Headlamp Low Beam Control	VII	—
3	2	BN/VT	293	Rear Defog Element Control	III	—
4 - 5	—	—	—	Not Occupied	—	-
6	1	YE	312	Right Headlamp Low Beam Control	VI	—
7	0.35	BN/VT	1969	Headlamp High Beam Relay Control	V	—
8	—	—	—	Not Occupied	—	-
9	0.5	BN/YE	2267	Mirror Heating Element Control	V	DLS
10	—	—	—	Not Occupied	—	-
11	0.35	BN/WH	28	Horn Relay Control	V	—
12	0.35	GN/WH	2270	Rear Window Washer Relay Control	V	CD6

X50A Fuse Block - Underhood X1 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
13	0.35	BN/VT	193	Rear Defog Relay Control	V	—
14	0.35	BN/GN	109	Hood Ajar Switch Signal	V	—
15	0.35	BN/GY	2268	Windshield Washer Relay Control	V	—
16	0.35	GY	91	Windshield Wiper Motor Relay Coil Control	V	—
17	0.5	BN/YE	2267	Mirror Heating Element Control	V	DLS
18 - 19	—	—	—	Not Occupied	—	-
20	0.35	WH/VT	860	Front Windshield Wiper Switch High Signal	V	—
21	0.75	RD/GY	1042	Battery Positive Voltage	VI	BTM
22	2	WH	92	Windshield Wiper Motor High Speed Control	I	—
23	4	RD/GN	40	Battery Positive Voltage	II	—
24	2	YE/BN	95	Windshield Wiper Motor Low Speed Control	III	—
25	—	—	—	Not Occupied	—	-
26	2.5	BK	450	Ground	III	—
27	—	—	—	Not Occupied	—	-
28	2	VT/GN	39	Run/Crank Ignition 1 Voltage	I	—
29	—	—	—	Not Occupied	—	-
30	0.5	RD/GY	402	Battery Positive Voltage	V	—
31	—	—	—	Not Occupied	—	-
32	0.5	GN/GY	333	Brake Fluid Level Sensor Signal	V	—
33	0.5	BN/WH	419	Check Engine Indicator Control	V	—
34	—	—	—	Not Occupied	—	-
35	0.35	YE	5420	Rear Wiper Motor Relay Coil Control	V	CD6
36	1	RD/VT	1640	Battery Positive Voltage	VI	CD6
37	1	BU	393	Rear Window Wiper Motor Control	VI	CD6
38	0.35	VT/WH	639	Run/Crank Ignition 1 Voltage	V	—
39 - 40	—	—	—	Not Occupied	—	-
41	0.35	GN/VT	5199	Run/Crank Relay Coil Control	V	—
42	0.35	VT/BN	841	Run Ignition 3 Voltage	V	UVC
43	0.35	RD/BN	440	Battery Positive Voltage	V	—
44 - 45	—	—	—	Not Occupied	—	-
46	0.75	RD/BU	5240	Battery Positive Voltage	VII	—
47	—	—	—	Not Occupied	—	-
48	2	RD/WH	140	Battery Positive Voltage	III	—
49	0.35	RD/YE	740	Battery Positive Voltage	IV	ALO
50	0.5	RD/VT	1640	Battery Positive Voltage	VII	—

X50A Fuse Block - Underhood X2



2220560

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 13732282
Service Connector: 13505902
Description: 50-Way F 1.5, 2.8 DSQ Metri-Pack 800 Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575718	J-35616-44 (YE)	J-38125-558	12110127	2	F	G
II	13327116	J-35616-35 (VT)	J-38125-36	Not Available	Not Available	Not Available	Not Available
III	13575773	J-35616-2A (GY)	J-38125-560	Not Available	Not Available	Not Available	Not Available
IV	13575774	J-35616-2A (GY)	J-38125-560	Not Available	Not Available	Not Available	Not Available
V	13575780	J-35616-35 (VT)	J-38125-36	Not Available	Not Available	Not Available	Not Available

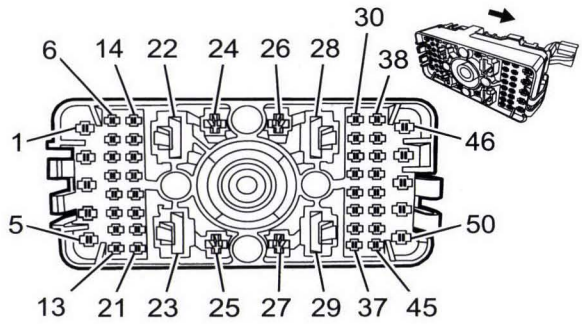
X50A Fuse Block - Underhood X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75 0.75	WH WH	311 311	Right Headlamp High Beam Control	V	EF7/Z49 -EF7-Z49
2 - 3	—	—	—	Not Occupied	—	-
4	0.75 0.75	GN GN	11 11	Headlamp High Beam Control	V	EF7/Z49 -EF7-Z49
5 - 10	—	—	—	Not Occupied	—	-
11	0.75 0.75	BN/GY BN/GY	29 29	Horn Control	IV	U05 -U05
12 - 13	—	—	—	Not Occupied	—	-
14	0.75	BU/VT	392	Rear Window Washer Pump Control	IV	CD6
15 - 25	—	—	—	Not Occupied	—	-
26	0.75	GY/VT	228	Windshield Washer Pump Control	V	—
27 - 28	—	—	—	Not Occupied	—	-
29	4	GY	532	Cooling Fan Motor Control (2)	I	—
30 - 37	—	—	—	Not Occupied	—	-

X50A Fuse Block - Underhood X2 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
38	0.5	VT/GN	839	Run/Crank Ignition 1 Voltage	III	—
39	0.5	VT/WH	639	Run/Crank Ignition 1 Voltage	IV	TR6
40 - 42	—	—	—	Not Occupied	—	-
43	0.5	BN/GN	109	Hood Ajar Switch Signal	III	—
44 - 45	—	—	—	Not Occupied	—	-
46	2	WH	92	Windshield Wiper Motor High Speed Control	II	RHD
47	2	YE/BN	95	Windshield Wiper Motor Low Speed Control	II	RHD
48	2	BK	750	Ground	II	RHD
49	1 1	YE YE	312 312	Right Headlamp Low Beam Control	V	EF7/Z49 -EF7-Z49
50	1 1	BN BN	12 12	Headlamp Low Beam Control	V	EF7/Z49 -EF7-Z49

X50A Fuse Block - Underhood X3



2220560

Connector Part Information

Harness Type: Engine
OEM Connector: 13732282
Service Connector: 13505902
Description: 50-Way F DSQ 1.5 2.8 Metri Pack 800 Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327182	J-35616-64B (L-BU)	J-38125-215A	Not Available	Not Avail-able	E	A
II	13327116	J-35616-64B (L-BU)	J-38125-215A	Not Available	Not Avail-able	E	A
III	13327116	J-35616-64B (L-BU)	J-38125-215A	Not Available	Not Avail-able	F	G

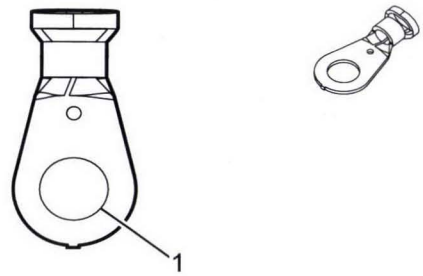
X50A Fuse Block - Underhood X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BN/WH	419	Check Engine Indicator Control	I	-
2	0.5	GN/GY	333	Brake Fluid Level Sensor Signal	I	-
3	-	-	-	Not Occupied	-	-
4	0.75	VT/WH	239	Run/Crank Ignition 1 Voltage	II	-
5	0.5	RD/BN	1742	Battery Positive Voltage	II	-
6-11	-	-	-	Not Occupied	-	-
12	0.5	BK	350	Ground	II	-
13-18	-	-	-	Not Occupied	-	-
19	0.5	VT/BK	339	Run/Crank Ignition 1 Voltage	II	-
20	-	-	-	Not Occupied	-	-
21	0.5	GY	139	Run/Crank Ignition 1 Voltage	II	-
22	-	-	-	Not Occupied	-	-
23	4	RD/WH	140	Battery Positive Voltage	III	-
24-27	-	-	-	Not Occupied	-	-
28	2.5	RD/GN	40	Battery Positive Voltage	III	-
29	3	RD/WH	640	Battery Positive Voltage	III	-
30	0.5	VT/BN	300	Run Ignition 3 Voltage	II	-

X50A Fuse Block - Underhood X3 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
31	0.5	RD/WH	2740	Battery Positive Voltage	II	-
32	0.5	VT/GN	39	Run/Crank Ignition 1 Voltage	II	-
33	0.5	RD/WH	3440	Battery Positive Voltage	II	-
34	0.5	RD/GY	2140	Battery Positive Voltage	II	-
35	0.5	RD/BN	2940	Battery Positive Voltage	II	CBT
36	0.5	RD/YE	240	Battery Positive Voltage	II	-
37	0.5	RD/VT	3340	Battery Positive Voltage	II	-
38-46	-	-	-	Not Occupied	-	-
47	0.75	RD/BU	840	Battery Positive Voltage	II	-
48	0.75	RD/VT	340	Battery Positive Voltage	II	-
49-50	-	-	-	Not Occupied	-	-

X50A Fuse Block - Underhood X4



2791579

Connector Part Information

Harness Type: Battery Cable
OEM Connector: CBR196-012
Service Connector: Service by Harness - See Part Catalog
Description: 1-Way Ring Terminal (NA)

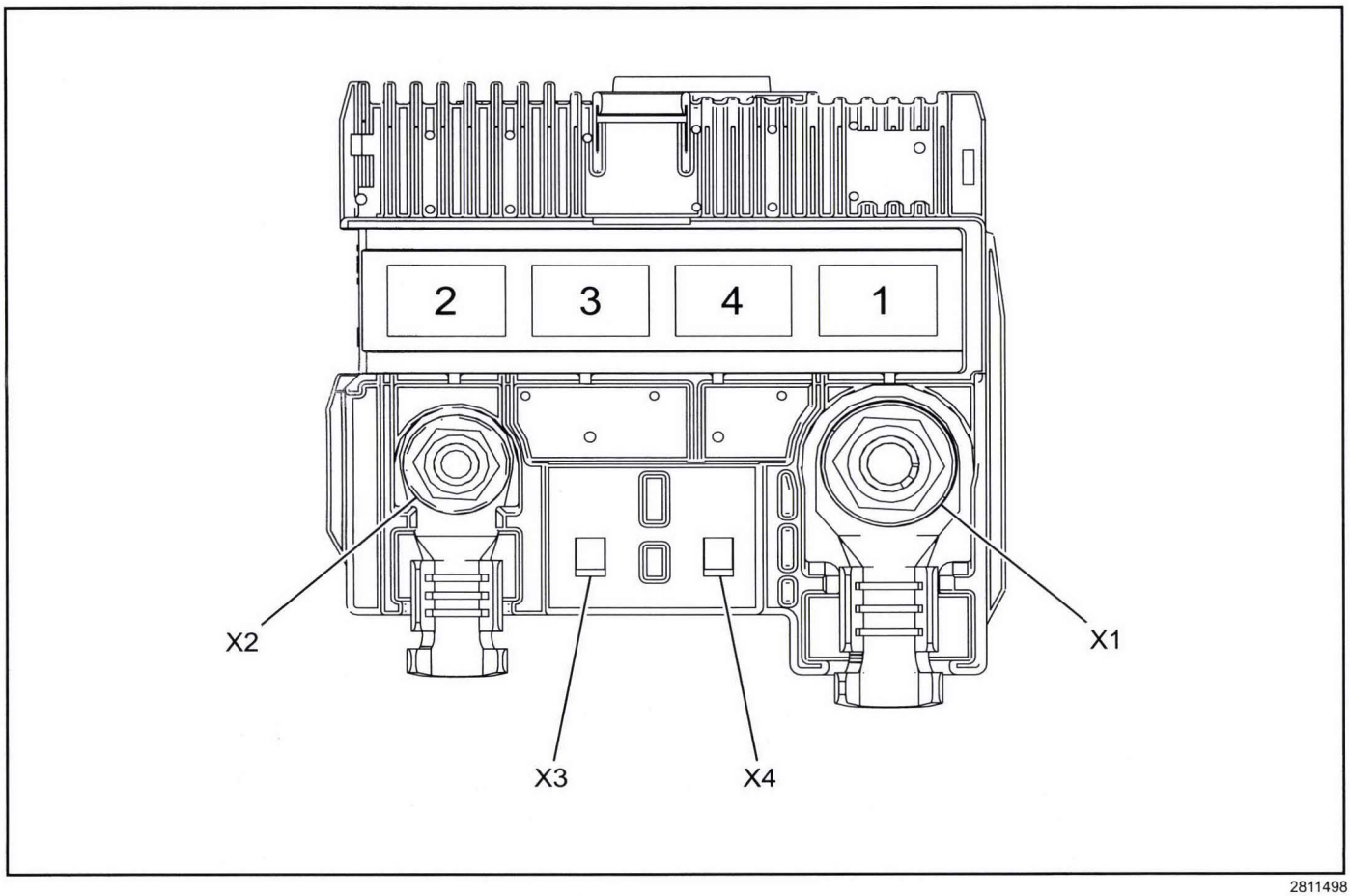
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	No Tool Required	No Tool Required	Not Available	Not Available	Not Available	Not Available

X50A Fuse Block - Underhood X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	16	VT/BK	3	Run/Crank Ignition 1 Voltage	I	-

X50D Fuse Block - Battery Top View

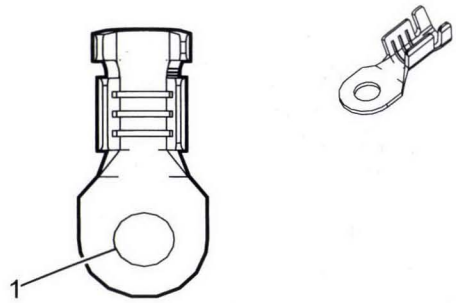


2811498

X50D Fuse Block - Battery Top View

No.	Device Label Name	Device Assigned Name	Rating	Description
1	APM	F1BA Fuse	200A	APM Fuse
2	UEC	F2BA Fuse	160A	X51 Fuse Block – Underhood
3	REC	F3BA Fuse	100A	X51 Fuse Block – Instrument Pane
4	EPS	F4BA Fuse	80A	K43 Power Steering Control Module

X50D Fuse Block - Battery X1



2811987

Connector Part Information

Harness Type: Battery
OEM Connector: 817325
Service Connector: Service by Harness – See Part Catalog
Description: 1-Way Ring Terminal (NA)

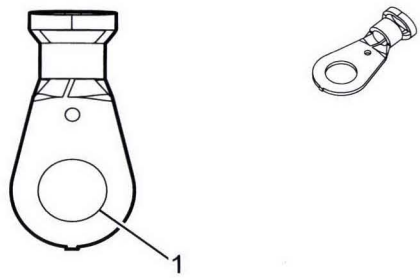
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Avail-able	No Tool Required	No Tool Required	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

X50D Fuse Block - Battery X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	25	RD	1	Battery Positive Voltage	I	-

X50D Fuse Block - Battery X2



2791579

Connector Part Information

Harness Type: Battery
OEM Connector: 817299
Service Connector: Service by Harness – See Part Catalog
Description: 1-Way Ring Terminal (NA)

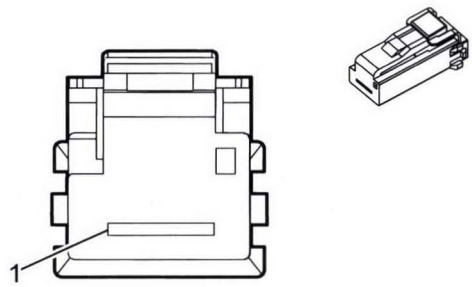
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	Not required	Not required	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

X50D Fuse Block - Battery X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	16	VT/BK	3	Battery Positive Voltage	I	-

X50D Fuse Block - Battery X3



2812279

Connector Part Information

Harness Type: Body
OEM Connector: MG610658-5
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 1-Way F 375 Series (BK)

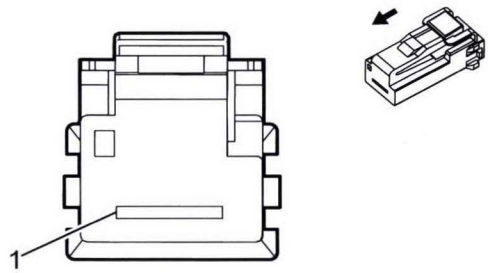
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

X50D Fuse Block - Battery X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	10	RD/WH	2740	Battery Positive Voltage	I	—

X50D Fuse Block - Battery X4



2812281

Connector Part Information

Harness Type: Body
OEM Connector: MG613689-1
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 1-Way F 375 Series

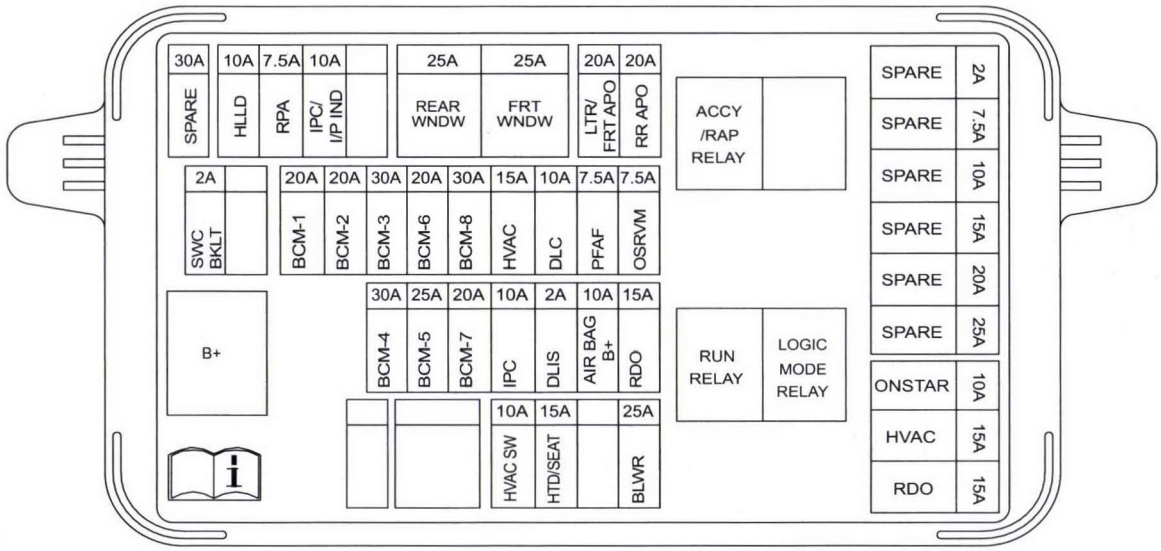
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

X50D Fuse Block - Battery X4

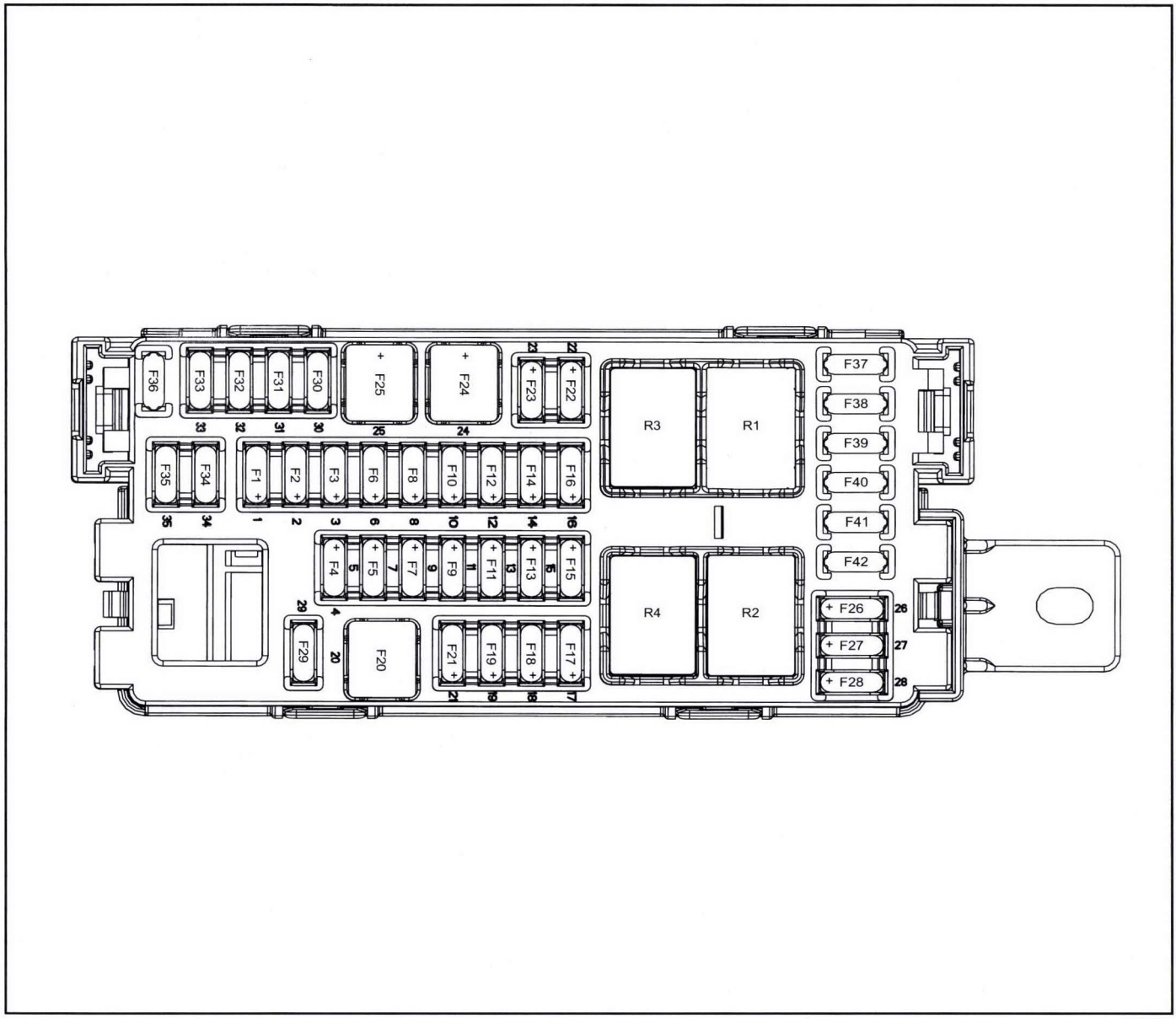
Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	10	RD/GN	1540	Battery Positive Voltage	I	—

X51A Fuse Block - Instrument Panel Label



3222019

X51A Fuse Block - Instrument Panel
Top View



3222027

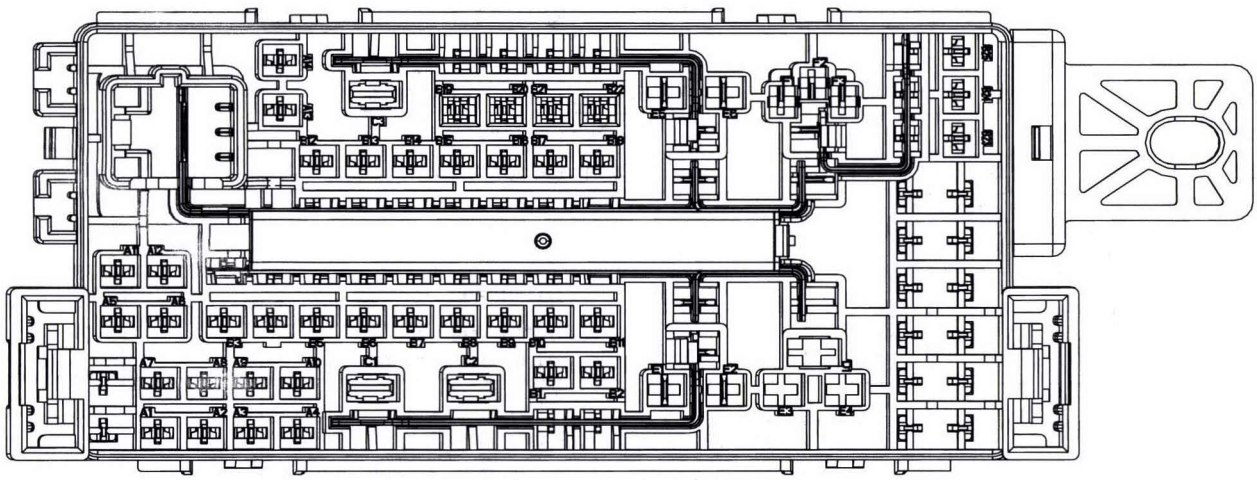
X51A Fuse Block - Instrument Panel Top View

No.	Device Label Name	Device Assigned Name	Rating	Description
F1	BCM1	F1DA	15A	K9 Body Control Module
F2	BCM2	F2DA	10A	K9 Body Control Module
F3	BCM3	F3DA	15A	K9 Body Control Module
F4	BCM4	F4DA	15A	K9 Body Control Module
F5	BCM5	F5DA	15A	K9 Body Control Module
F6	BCM6	F6DA	15A	K9 Body Control Module
F7	BCM7	F7DA	15A	K9 Body Control Module
F8	BCM8	F8DA	20A	K9 Body Control Module
F9	IPC	F9DA	10A	P16 Instrument Cluster
F10	HVAC	F10DA	—	Not Used
F11	DLIS	F11DA	2A	S39 Ignition Switch

X51A Fuse Block - Instrument Panel Top View (cont'd)

No.	Device Label Name	Device Assigned Name	Rating	Description
F12	DLC	F12DA	30A	X84 Data Link Connector
F13	AIRBAG B+	F13DA	10A	K36 Inflatable Restraint Sensing and Diagnostic Module
F14	PFAF	F14DA	7.5A	K132 Pedestrian Alert Sound Control Module
F15	RDO	F15DA	—	Not Occupied
F16	OSRVM	F16DA	7.5A	S52 Outside Rearview Mirror Switch
F17	BLWR	F17DA	25A	M8 Blower Motor
F18	Not Occupied	F18DA	—	Not Occupied
F19	HTD/SEAT	F19DA	15A	S32D Seat Heating Switch — Driver, S32P Seat Heating Switch — Passenger
F20	Not Occupied	F20DA	—	Not Occupied
F21	HVAC SW	F21DA	20A	K33 HVAC Control Module
F22	Not Occupied	F22DA	—	Not Occupied
F23	LTR/APO	F23DA	20A	X80G Accessory Power Receptacle - Instrument Panel
F24	FRT WNDW	F24DA	25A	S79D Window Switch — Driver, Window Switch — Passenger
F25	REAR WNDW	F25DA	10A	S79D Window Switch — Drive
F26	ONSTAR	F26DA	10A	K73 Telematics Communication Interface Control Module
F27	HVAC	F27DA	10A	K33 HVAC Control Module
F28	RDO	F28DA	15A	A11 Radio
F29	Not Occupied	F29DA	—	Not Occupied
F30	AIR BAG IGN	F30DA	10A	K36 Inflatable Restraint Sensing and Diagnostic Module
F31	IPC I/P IND	F31DA	10A	P16 Instrument Panel Cluster, P17 Info Display Module
F32	RPA	F32DA	7.5A	K41R Rear Parking Assist Control Module
F33	HLLD	F32DA	10A	S16 Driver Information Center Switch
F34	Not Occupied	F34DA	—	Not Used
F35	SWC BKLT	F35DA	2A	S70L Steering Wheel Controls Switch - Left, S70R Steering Wheel Controls Switch - Right
F36	SPARE	F36DA	30A	Not Used
F37	SPARE	F37DA	2A	Not Used
F38	SPARE	F38DA	7.5A	Not Used
F39	SPARE	F39DA	10A	Not Used
F40	SPARE	F40DA	15A	Not Used
F41	SPARE	F41DA	20A	Not Used
F42	SPARE	F42DA	25A	Not Used
Relays				
R1	Not Occupied	—	—	—
R2	LOGIC MODE RELAY	KR104A Battery Saver Relay 1	—	F26DA F27DA, F28DA
R3	ACCY/RAP RELAY	KR76 Retained Accessory Power Relay	—	F22DA, F23DA, F24DA, F25DA
R4	RUN RELAY	KR74 Ignition Run Relay	—	F17DA, F18DA, F19DA, F20DA, F21DA

X51A Fuse Block - Instrument Panel, Wire Entry



3222055

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: Not Available
Service Connector: Service by Harness – See Part Catalog
Description: 53-Way F

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575761	J-35616-35 (VT)	J-38125-36	964280-2	15	E	2
II	13578858	J-35616-35 (VT)	J-38125-36	4-965999-1	25	4	A
III	13578860	J-35616-35 (VT)	J-38125-36	2-964284-1	11	E	A

Terminal Part Information (cont'd)

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
IX	13575706	J-35616-42 (RD)	J-38125-36	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

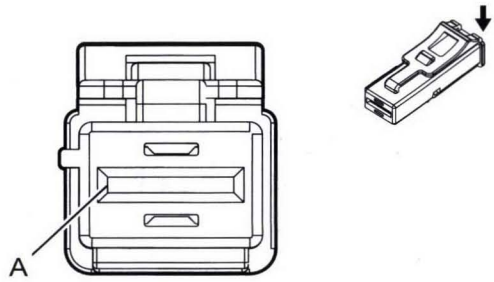
X51A Fuse Block - Instrument Panel, Wire Entry

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A1	2	VT/GN	39	Run/Crank Ignition 1 Voltage	II	TR6
A2	2	VT/GN	39	Run/Crank Ignition 1 Voltage	II	—
A3	2	VT/GN	39	Run/Crank Ignition 1 Voltage	II	—
A4	-	-	-	Not Occupied	-	-
A5	0.35	YE	6817	LED Backlight Dimming Control	I	—
A6	-	-	-	Not Occupied	-	-
A7	0.5	VT/BK	339	Run/Crank Ignition 1 Voltage	I	TR6
A8	0.5	VT/BN	141	A8	I	—
A9	0.5	VT/GY	139	Run/Crank Ignition 1 Voltage	I	—
A10	-	-	-	Not Occupied	-	-
A11	0.35 0.35	YE YE	6817 6817	LED Backlight Dimming Control LED Backlight Dimming Control	III	—
A12–14	-	-	-	Not Occupied	-	-
B1	1	VT	801	Retained Accessory Power Fuse Supply Voltage	I	–
B2	1	VT	2101	Retained Accessory Power Fuse Supply Voltage	III	—
B3	1	RD/BN	1140	Battery Positive Voltage	III	—
B4	1	RD/GY	2140	Battery Positive Voltage	III	—
B5	2.5	RD/BN	2240	Battery Positive Voltage	II	—
B6	1	RD/BU	2540	Battery Positive Voltage	I	—
B7	2	RD	1840	Battery Positive Voltage	II	—
B8	0.5 0.75	RD/WH RD/WH	2040 2040	Battery Positive Voltage Battery Positive Voltage	III	CW1
B9	0.5 0.5	RD/BN RD/BN	2240 2240	Battery Positive Voltage Battery Positive Voltage	III	—
B10	0.35	RD/GN	2440	Battery Positive Voltage	I	—
B11	0.5	RD/VT	2640	Battery Positive Voltage	I	—
B12	2.5	RD/YE	2340	Battery Positive Voltage	II	—
B13	2.5	RD/GN	1540	Battery Positive Voltage	II	—
B14	1	RD/VT	2640	Battery Positive Voltage	III	—
B15	0.5	RD/VT	1940	Battery Positive Voltage	I	—
B16	0.35	RD/GN	2440	Battery Positive Voltage	I	—
B17	0.05	RD/WH	640	Battery Positive Voltage	I	—
B18	0.75	RD/BU	2540	Battery Positive Voltage	III	CW1
B19	0.5	VT/BN	441	Run Ignition 3 Voltage	I	—
B20	0.75	VT/BN	341	Run Ignition 3 Voltage	I	C37/C38
B21	-	-	-	Not Occupied	-	-
B22	2.5	VT/BN	41	Run Ignition 3 Voltage	II	—
B23	0.5	RD/YE	2340	Battery Positive Voltage	I	UE1
B24	0.75 0.75	RD/WH RD/WH	2040 2040	Battery Positive Voltage Battery Positive Voltage	II	–CW1

X51A Fuse Block - Instrument Panel, Wire Entry (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
B25	0.75	RD/BU	2540	Battery Positive Voltage	III	–CW1
C1	1.5	VT	1701	Retained Accessory Power Fuse Supply Voltage	II	—
C2	1.50 1.50	VT VT	1301 1301	Retained Accessory Power Fuse Supply Voltage Retained Accessory Power Fuse Supply Voltage	IX	—
C3–D1	-	-	-	Not Occupied	-	-
E1	0.35	GY/VT	755	RAP Relay Coil Control	I	—
E2	0.35	BK	750	Ground	I	—
E3–E4	-	-	-	Not Occupied	-	-
E5	0.35	BN/VT	5486	Run Relay Coil Control	I	—
E6	0.35	BK	750	Ground	I	—
F1	0.35	GY/VT	3264	Logistic Mode Relay Close Control	I	-CW1
F2	0.35	BK	750	Ground	I	-CW1
F3	0.35	VT/BU	3263	Logistic Mode Relay Open Control	I	-CW1

X51A Fuse Block - Instrument Panel X1



2812417

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 2005400-2
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 1-Way F 9.5 Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

X51A Fuse Block - Instrument Panel X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	10	RD/WH	2740	Battery Positive Voltage	I	—

X55W Fuse Holder – Hybrid/EV Battery Pack Coolant Heater X1

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: L1.25-5
Service Connector: Service by Harness - See Part Catalog
Description: one Way Ring Terminal

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

X55W Fuse Holder – Hybrid/EV Battery Pack Coolant Heater X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GN	3	High Voltage (+)	I	-

X55W Fuse Holder - Hybrid/EV Battery Pack Coolant Heater X2

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: JST L1 .25-5
Service Connector: Service by Harness - See Part Catalog
Description: One Way Terminal Ring

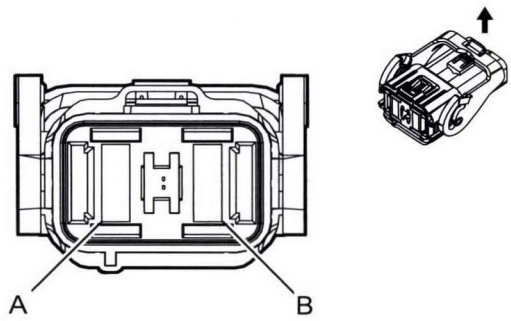
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Avail-able	Not Available	Not Available	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

X55W Fuse Holder - Hybrid/EV Battery Pack Coolant Heater X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG	3	HIgh Voltage Battery (+)	I	-

Component Connector End Views
A4 Hybrid/EV Battery Pack X1



3637814

Connector Part Information

Harness Type: Battery Cable
OEM Connector: 13953995
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F High Voltage Series, Sealed (OG)

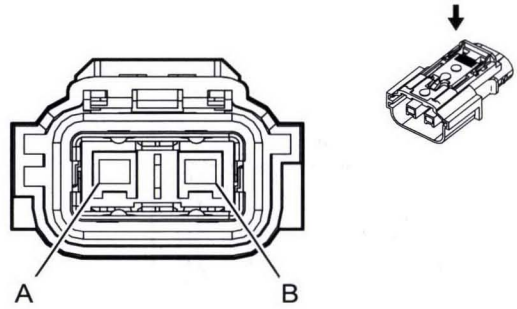
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

A4 Hybrid/EV Battery Pack X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	35	OG	3965	High Voltage Battery 3 (-)	I	—
B	35	OG	3966	High Voltage Battery 3 (+)	I	—

A4 Hybrid/EV Battery Pack X2



3637567

Connector Part Information

Harness Type: High Voltage
OEM Connector: 13830159
Service Connector: Service by Harness – See Part Catalog
Description: 2-Way M (OG)

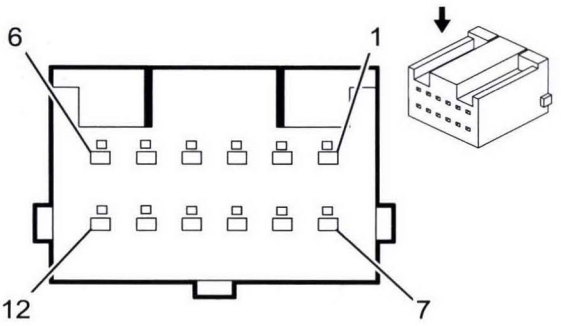
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	Service by Harness – See Part Catalog	Service by Harness – See Part Catalog	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

A4 Hybrid/EV Battery Pack X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	2	OG	3834	High Voltage Battery (+)	I	—
B	2	OG/BK	3833	High Voltage Battery (-)	I	—

A9A Outside Rearview Mirror - Driver



2676921

Connector Part Information

Harness Type: Driver Door
OEM Connector: ARVPB-12-2AK
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 12-Way F 0.64 Series (BK)

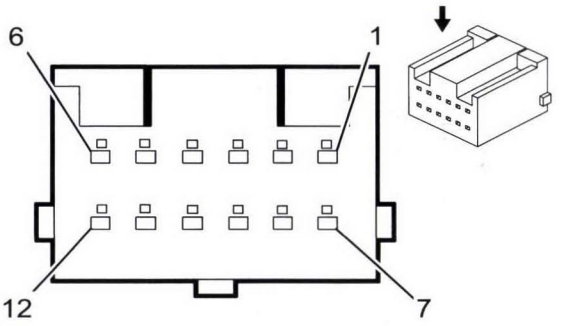
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

A9A Outside Rearview Mirror - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	-
3	0.5	BU/WH	1314	Left Front Turn Signal Lamp Control	I	DLS+(EF7/Z49)
4	—	—	—	Not Occupied	—	-
5	0.5	BK	750	Ground	I	DLS+(EF7/Z49)
6 - 7	—	—	—	Not Occupied	—	-
8	0.5	BN/YE	2267	Mirror Heating Element Control	I	DLS+(EF7/Z49)
9	0.5	VT/BU	3390	Driver Mirror Motor Up (+) Down (-) Control	I	(DLS/D71) +(EF7/Z49)
10	0.5	BN/BK	3389	Driver Mirror Motor Right (+) Left (-) Control	I	(DLS/D71) +(EF7/Z49)
11	—	—	—	Not Occupied	—	-
12	0.5	YE/BN	3391	Driver Mirror Motor Common Control	I	(DLS/D71) +(EF7/Z49)

A9B Outside Rearview Mirror - Passenger



2676921

Connector Part Information

Harness Type: Passenger Door
OEM Connector: ARVPB-12-2AK
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 12-Way F 0.64 Series (BK)

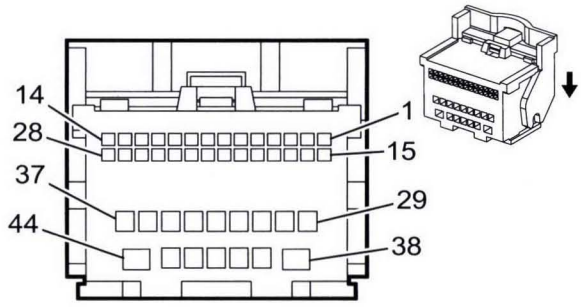
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

A9B Outside Rearview Mirror - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 4	—	—	—	Not Occupied	—	-
5	0.5	BK	750	Ground	I	DLS+(EF7/Z49)
6	0.5	GN/VT	1315	Right Front Turn Signal Lamp Control	I	DLS+(EF7/Z49)
7	—	—	—	Not Occupied	—	-
8	0.5	BN/YE	2267	Mirror Heating Element Control	I	DLS+(EF7/Z49)
9	0.5	YE/VT	3397	Passenger Mirror Motor Up (+) Down (-) Control	I	(DLS/D71) +(EF7/Z49)
10	0.5	GN/BK	3396	Passenger Mirror Motor Right (+) Left (-) Control	I	(DLS/D71) +(EF7/Z49)
11	—	—	—	Not Occupied	—	-
12	0.5	WH	3398	Passenger Mirror Motor Common Control	I	(DLS/D71) +(EF7/Z49)

A11 Radio X1



1974986

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: RADPB-44-1AK
Service Connector: 88988902
Description: 44-Way F GT 64 Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575866	J-35616-64B (L-BU)	J-38125-215A	SAIT-A03T-M064	14	P	P
II	13327111	J-35616-2A (GY)	J-38125-553	12191812	19	C	A
III	13327130	J-35616-4A (PU)	J-38125-553	15304711	8	2	A

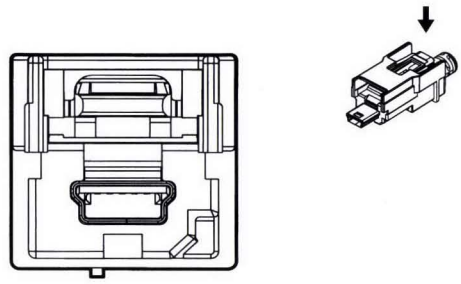
A11 Radio X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1-3	-	-	-	Not Occupied	-	-
4	0.35	BK/BN	654	Cellular Telephone Microphone Low Reference	I	UE1
5	-	-	-	Not Occupied	-	-
6	0.35	BK/YE	659	Cellular Telephone Voice Low Reference	I	UE1
7	0.35	GY/YE	6972	Camera Signal #2 +	I	UVC
8	0.35	WH/BU	6973	Camera Signal #2	I	UVC
9	-	-	-	Not Occupied	-	-
10	0.35	GN	5841	Right Auxiliary Audio Signal (2)	I	UNI
11	0.35	BU	2060	Auxiliary Detection Signal	I	UNI
12-14	-	-	-	Not Occupied	-	-
15	0.35	BK/VT	3109	Economy Mode Switch Low Reference	I	UNI
16	-	-	-	Not Occupied	-	-
17	0.5	BK/WH	651	Signal Ground	I	UNI
18	0.35	BU	655	Cellular Telephone Microphone Signal	I	UE1
19	-	-	-	Not Occupied	-	-
20	0.35	YE	658	Cellular Telephone Voice Signal	I	UE1
21	0.35	BU	3373	Auxiliary Video High Signal (2)	I	UNI

A11 Radio X1 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
22	0.5	BK/WH	751	Signal Ground	I	UNI
23	0.35	VT	5843	Auxiliary Audio Common Signal	I	UNI
24	0.35	GY	5839	Left Auxiliary Audio Signal (2)	I	UNI
25-27	-	-	-	Not Occupied	-	-
28	0.5	GN	5060	Low Speed GMLAN Serial Data	I	UNI
29-30	-	-	-	Not Occupied	-	-
31	0.75	YE/BK	117	Right Front Speaker Signal (-) (1)	II	UNI
32	0.75	BN/BU	118	Left Front Speaker Signal (-) (1)	II	UNI
33	0.75	BU/BK	115	Right Rear Speaker Signal (-)	II	LHD
34	0.75	GN/BK	116	Left Rear Speaker Signal (-)	II	LHD
35-37	-	-	-	Not Occupied	-	-
38	0.75	BK	850	Ground	III	UNI
39	0.75	YE	200	Right Front Speaker (+) (1)	II	UNI
40	0.75	BU	201	Left Front Speaker (+) (1)	II	UNI
41	0.75	WH	46	Right Rear Speaker (+)	II	LHD
42	0.75	GN	199	Left Rear Speaker (+)	II	LHD
43	-	-	-	Not Occupied	-	-
44	0.75	RD/BU	2540	Battery Positive Voltage	III	UNI

A11 Radio X2



2807715

Connector Part Information

Harness Type: Instrument Panel USB
OEM Connector: 13868840
Service Connector: Service by Cable Assembly — See Parts Catalog
Description: 5-Way F USB Type (GY)

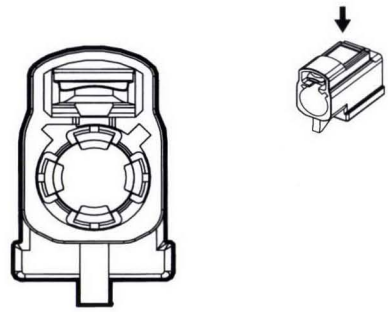
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

A11 Radio X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	USB	—	USB Serial Data	I	—

A11 Radio X3



3214010

Connector Part Information

Harness Type: COAX
OEM Connector: 13658176
Service Connector: Service by Cable Assembly — See Parts Catalog
Description: 1-Way F Coax Type (BK)

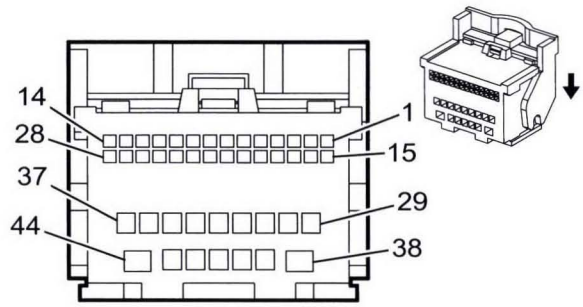
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Avail-able	Not Available	Not Available	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

A11 Radio X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
–	—	COAX	—	Antenna RF Signal	I	—

A11 Radio X4



1974986

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: RADPB-44-1AK
Service Connector: 88988902
Description: 44-Way F 0.64, 150, 280 GT Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575735	J-35616-14 (GN)	J-38125-553	12191812	11	C	A
II	13575753	J-35616-4A (PU)	J-38125-553	15304711	11	2	A
III	13575867	J-35616-64B (LT BU)	J-38125-215A	SAIT-A03T-M064	23	P	P

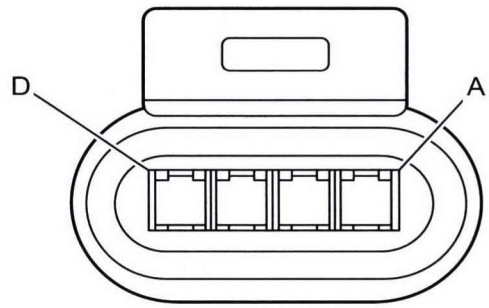
A11 Radio X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 3	—	—	—	Not Occupied	—	-
4	0.35 0.35	GY/YE BK/BN	5149 654	Voice Recognition Audio Signal Cellular Telephone Microphone Low Reference	III	UE1 -UE1
5	—	—	—	Not Occupied	—	-
6	0.35	BK/YE	659	Cellular Telephone Voice Low Reference	III	UE1
7	0.35	GY/YE	6972	Camera Signal 2 +	III	UVC
8	0.35	WH/BU	6973	Camera Signal 2	III	UVC
9	—	—	—	Not Occupied	—	-
10	0.35	GN	5841	Right Auxiliary Audio Signal (2)	III	—
11	0.35	BU	2060	Auxiliary Detection Signal	III	—
12 - 14	—	—	—	Not Occupied	—	-
15	0.35	BK/VT	3109	Economy Mode Switch Low Reference	III	—
16	—	—	—	Not Occupied	—	-
17	0.5	BK/WH	651	Signal Ground	III	—
18	0.35 0.35	BK/GY BU	5152 655	Voice Recognition Audio Low Reference Cellular Telephone Microphone Signal	III	UE1 -UE1
19	—	—	—	Not Occupied	—	-
20	0.35	YE	658	Cellular Telephone Voice Signal	III	UE1

A11 Radio X4 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
21	0.35	BU	3373	Auxiliary Video High Signal (2)	III	—
22	0.5	BK/WH	751	Signal Ground	III	—
23	0.35	VT	5843	Auxiliary Audio Common Signal	III	—
24	0.35	GY	5839	Left Auxiliary Audio Signal (2)	III	—
25 - 27	—	—	—	Not Occupied	—	-
28	0.5	GN	5060	Low Speed GMLAN Serial Data	III	—
29 - 30	—	—	—	Not Occupied	—	-
31	0.75	YE/BK	117	Right Front Speaker Signal (-) (1)	I	—
32	0.75	BN/BU	118	Left Front Speaker Signal (-) (1)	I	—
33	0.75	BU/BK	115	Right Rear Speaker Signal (-)	I	—
34	0.75	GN/BK	116	Left Rear Speaker Signal (-)	I	—
35 - 37	—	—	—	Not Occupied	—	-
38	0.75	BK	850	Ground	II	—
39	0.75	YE	200	Right Front Speaker Control (+) (1)	I	—
40	0.75	BU	201	Left Front Speaker Control (+) (1)	I	—
41	0.75	WH	46	Right Rear Speaker Control (+)	I	—
42	0.75	GN	199	Left Rear Speaker Control (+)	I	—
43	—	—	—	Not Occupied	—	-
44	0.75 0.75	RD/BU RD/BU	2540 2540	Battery Positive Voltage	II	CW1 -CW1

A23D Door Latch Assembly - Driver X1



1891414

Connector Part Information

Harness Type: Driver Door
OEM Connector: AK32421
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 4-Way F (GY)

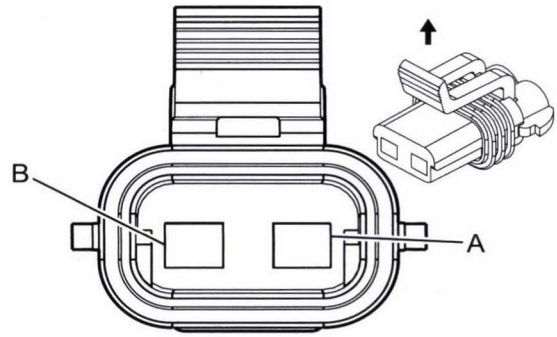
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required

A23D Door Latch Assembly - Driver X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.75	YE/BN	1123	Door Lock Key Switch Lock Signal	I	AU3
B	0.75	BK	650	Ground	I	AU3
C	0.75	BU/VT	1124	Door Lock Key Switch Unlock Signal	I	AU3
D	—	—	—	Not Occupied	—	—

A23D Door Latch Assembly - Driver X2



68721

Connector Part Information

Harness Type: Driver Door
OEM Connector: 15300027
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 280 Metri-Pack Series, Sealed (BK)

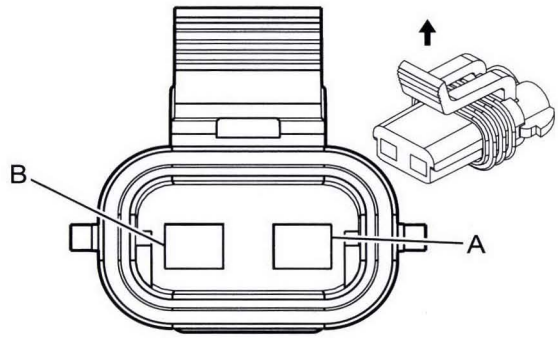
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-4A (PU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

A23D Door Latch Assembly - Driver X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.75	BN/YE	294	Door Lock Actuator Unlock Control	I	—
B	0.75	GY	5911	Door Lock Actuator Lock Control 2	I	—

A23LR Door Latch Assembly - Left Rear



68721

Connector Part Information

Harness Type: Left Rear Door
OEM Connector: 15300027
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 280 Metri-Pack Series, Sealed (BK)

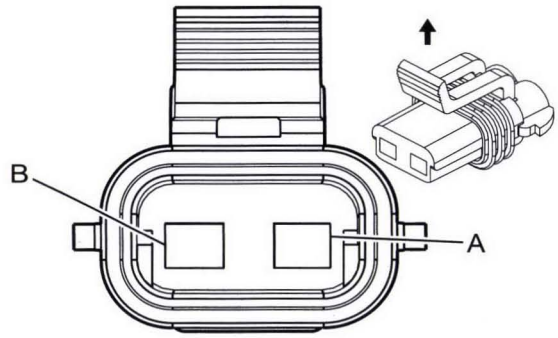
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-4A (PU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

A23LR Door Latch Assembly - Left Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	BN/YE	294	Door Lock Actuator Unlock Control	I	—
B	0.5	GY	295	Door Lock Actuator Lock Control	I	—

A23P Door Latch Assembly - Passenger



68721

Connector Part Information

Harness Type: Passenger Door
OEM Connector: 15300027
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 280 Metri-Pack Series, Sealed (BK)

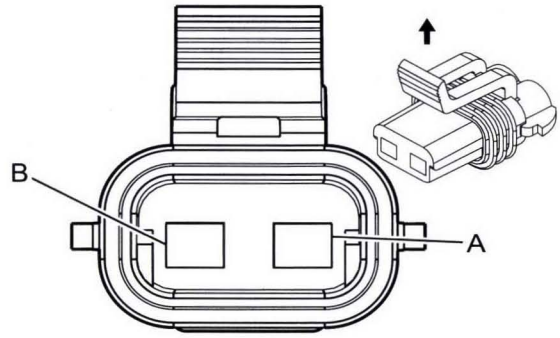
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-4A (PU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

A23P Door Latch Assembly - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	BN/YE	294	Door Lock Actuator Unlock Control	I	—
B	0.5	GY	295	Door Lock Actuator Lock Control	I	—

A23RR Door Latch Assembly - Right Rear



68721

Connector Part Information

Harness Type: Right Rear Door
OEM Connector: 15300027
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 280 Metri-Pack Series, Sealed (BK)

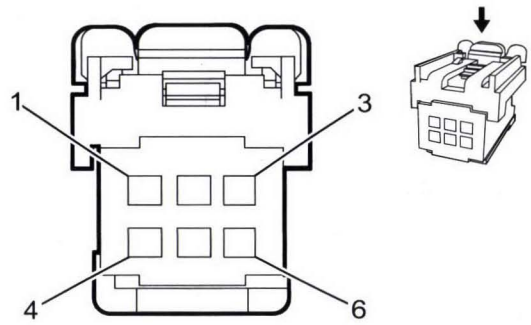
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-4A (PU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

A23RR Door Latch Assembly - Right Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	BN/YE	294	Door Lock Actuator Unlock Control	I	—
B	0.5	GY	295	Door Lock Actuator Lock Control	I	—

A26 HVAC Controls



2173863

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 1419158-5
Service Connector: 13337944
Description: 6-Way F 0.64 Series (BK)

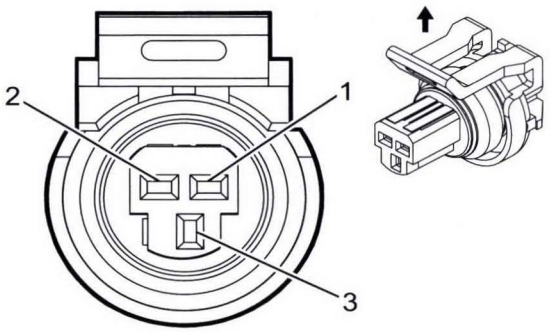
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

A26 HVAC Controls

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GN/YE	7531	Local Interconnect Network Serial Data Bus 9	I	—
2	0.75	BK	750	Ground	I	—
3	0.75	RD/WH	2040	Battery Positive Voltage	I	-CW1
4	0.5	RD/WH	2040	Battery Positive Voltage	I	CW1
5 - 6	—	—	—	Not Occupied	—	—

B1 A/C Refrigerant Pressure Sensor



1519475

Connector Part Information

Harness Type: Engine
OEM Connector: 13532244
Service Connector: 88988301
Description: 3-Way F 150 GT Series, Sealed (BK)

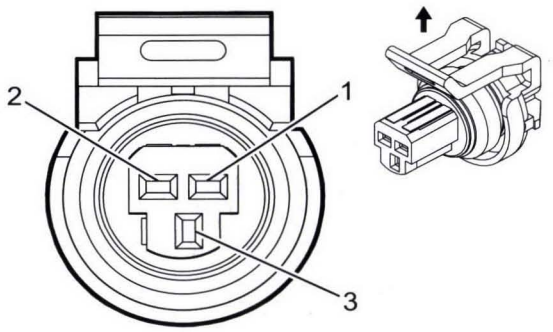
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B1 A/C Refrigerant Pressure Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK/BN	5514	A/C Refrigerant Pressure Sensor Low Reference	I	—
2	0.5	BN/RD	2700	A/C Pressure Sensor 5 Volt Reference	I	—
3	0.5	GN	380	A/C Refrigerant Pressure Sensor Signal	I	—

B1C A/C Refrigerant Pressure Sensor



1519475

Connector Part Information

Harness Type: Engine
OEM Connector: 13532244
Service Connector: 88988301
Description: 3-Way F 150 GT Series, Sealed (BK)

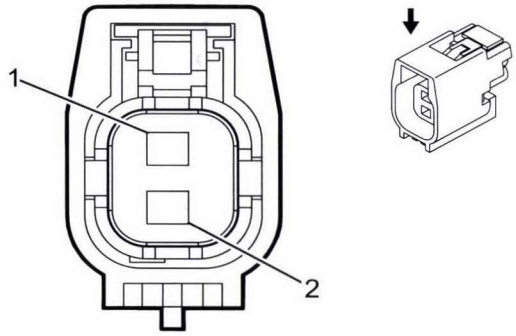
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B1C A/C Refrigerant Pressure Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK/GN	476	Sensor Low Reference	I	—
2	0.5	BU/RD	474	5 Volt Reference	I	—
3	0.5	BU	204	A/C Low Pressure Sensor Signal	I	—

B5LF Wheel Speed Sensor - Left Front



2152684

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 7287-0973-30
Service Connector: 13586115
Description: 2-Way F 1.5 GT Series, Sealed (BK)

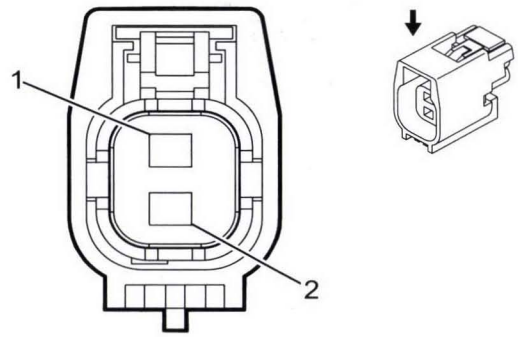
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B5LF Wheel Speed Sensor - Left Front

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GY	830	Wheel Speed Sensor Signal Left Front	I	—
2	0.5	BK/GY	873	Left Front Wheel Speed Sensor Low Reference	I	—

B5LR Wheel Speed Sensor - Left Rear



2152684

Connector Part Information

Harness Type: Body
OEM Connector: 7287-0973-30
Service Connector: 13586115
Description: 2-Way F 1.5 GT Series, Sealed (BK)

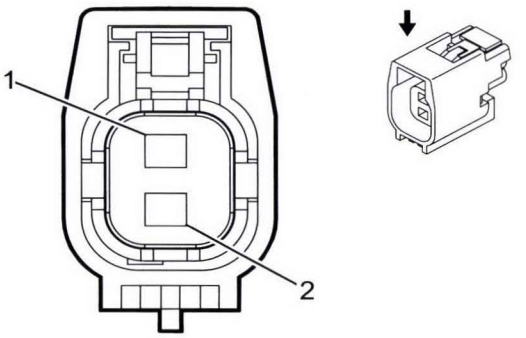
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B5LR Wheel Speed Sensor - Left Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BU	884	Wheel Speed Sensor Signal Left Rear	I	—
2	0.5	BK/BU	885	Wheel Speed Sensor Low Reference Left Rear	I	—

B5RF Wheel Speed Sensor - Right Front



2152684

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 7287-0973-30
Service Connector: 13586115
Description: 2-Way F 1.5 GT Series, Sealed (BK)

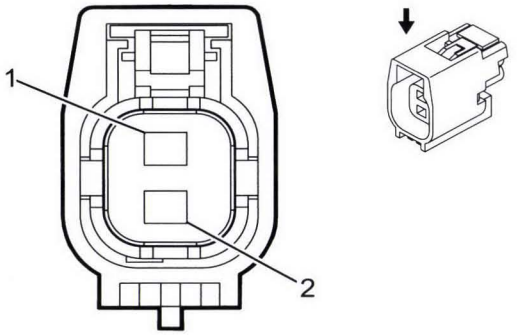
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B5RF Wheel Speed Sensor - Right Front

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	YE	872	Wheel Speed Sensor Signal Right Front	I	—
2	0.5	BK/YE	833	Wheel Speed Sensor Low Reference Right Front	I	—

B5RR Wheel Speed Sensor - Right Rear



2152684

Connector Part Information

Harness Type: Body
OEM Connector: 7287-0973-30
Service Connector: 13586115
Description: 2-Way F 1.5 GT Series, Sealed (BK)

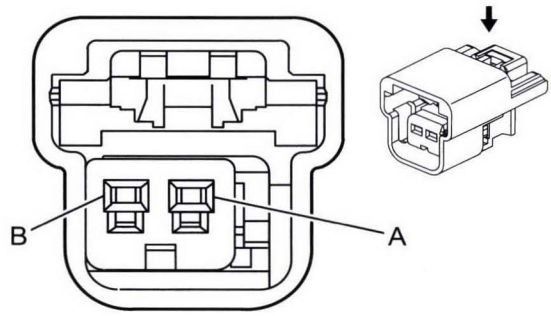
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B5RR Wheel Speed Sensor - Right Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	VT	882	Wheel Speed Sensor Signal Right Rear	I	—
2	0.5	BK/VT	883	Wheel Speed Sensor Low Reference Right Rear	I	—

B7A Inside Air Temperature Sensor



1385747

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 15332129
Service Connector: 15306425
Description: 2-Way F 150 GT Series (BK)

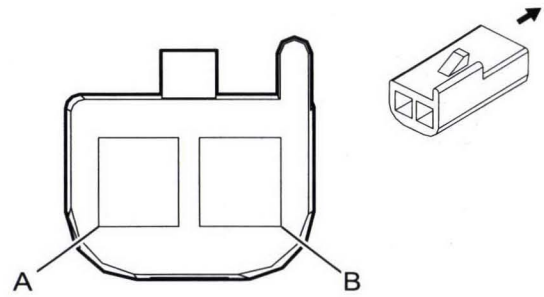
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-64B (L-BU)	Not Available	Not Available	Not Available	Not Available	Not Available

B7A Inside Air Temperature Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	BN/BK	405	Lower Air Temperature Sensor Signal	I	—
B	-	-	-	Not Occupied	-	-

B7B Air Temperature Sensor - Duct Lower



82383

Connector Part Information

Harness Type: HVAC
OEM Connector: 12047662
Service Connector: 12085535
Description: 2-Way F Metri Pack 150 Series (BK)

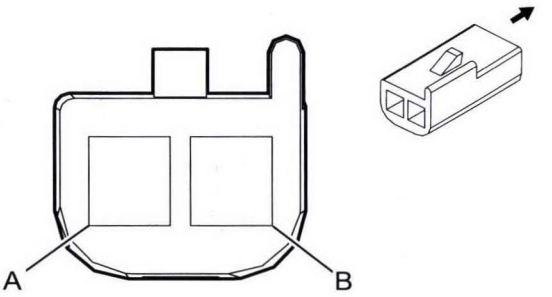
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327110	J-35616-2A (GY)	J-38125-553	12191812	11	E	C

B7B Air Temperature Sensor - Duct Lower

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.35	D-BU	518	Lower Left Air Temperature Sensor Signal	I	—
B	0.35	BK	407	Sensor Low Reference	I	—

B7F Air Temperature Sensor - Duct Upper



82383

Connector Part Information

Harness Type: HVAC
OEM Connector: 12047662
Service Connector: 12085535
Description: 2-Way F Metri Pack 150 Series (BK)

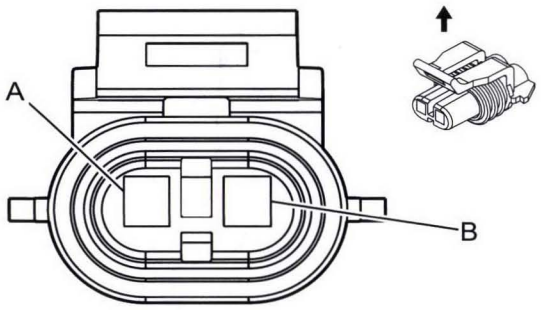
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327110	J-35616-2A (GY)	J-38125-553	12191812	11	E	C

B7F Air Temperature Sensor - Duct Upper

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.35	GY/D-GN	516	Upper Left Air Temperature Sensor Signal	I	—
B	0.35	BK	407	Sensor Low Reference	I	—

B9 Ambient Air Temperature Sensor



684793

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 12052642
Service Connector: 12101856
Description: 2-Way F 150 Metri-Pack Series, Sealed (L-GN)

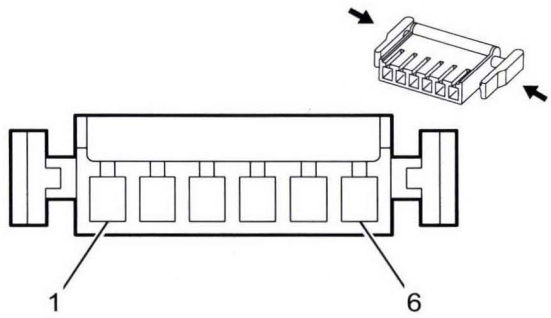
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B9 Ambient Air Temperature Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	BU/GY	636	Outside Ambient Air Temperature Sensor Signal	I	—
B	0.5	BK/BU	61	Outside Ambient Temperature Sensor Low Reference	I	—

B10B Ambient Light/Sunload Sensor



2173602

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 13726957
Service Connector: 13576539
Description: 6-Way F 0.64 Micro-Quadlock Series (BK)

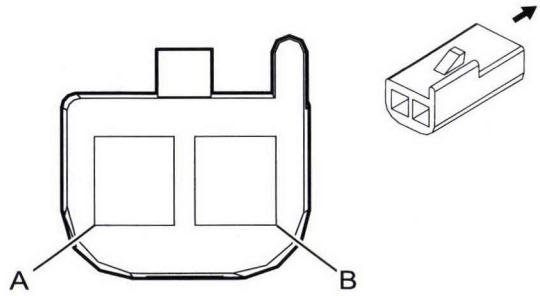
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B10B Ambient Light/Sunload Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	-
3	0.35	BU/WH	734	Inside Air Temperature Sensor Signal	I	—
4	0.35	YE/VT	1783	Twilight Sentinel Delay Signal	I	—
5	0.35	WH/BU	278	Ambient Light Sensor Signal	I	T83
6	0.35	BK/BN	6102	Inside Air Temperature Sensor Low Reference	I	—

B13 Transmission Fluid Temperature Sensor



82383

Connector Part Information

Harness Type: Transmission
OEM Connector: 12047662
Service Connector: 12085535
Description: 2-Way F Metri Pack 150 Series s(BK)

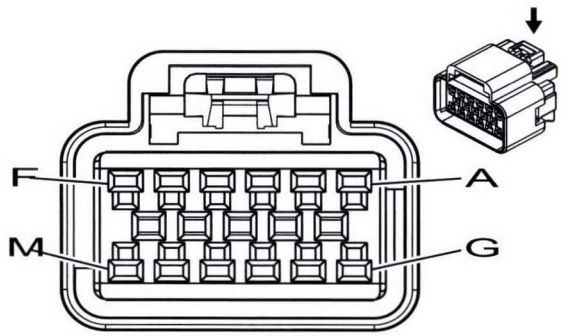
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575867	J-35616-14 (GN)	J-38125-12A	15326030	1	E	C

B13 Transmission Fluid Temperature Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.35	BK	2032	Transmission Temperature Sensor Signal	I	-
B	0.35	BK	2761	Transmission Temperature Sensor Low Reference	I	-

B15 Transmission Internal Mode Switch



647976

Connector Part Information

Harness Type: Transmission
OEM Connector: 15332161
Service Connector: 15306416
Description: 12-Way F 150 GT Series (BK)

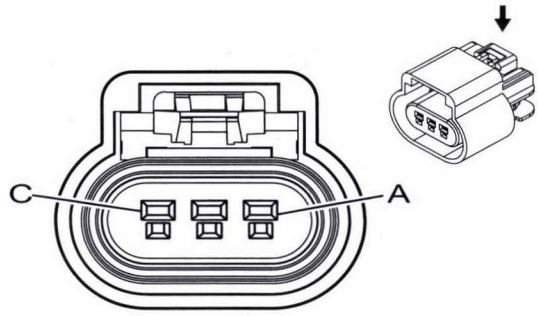
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575735	J-35616-2A (GY)	J-38125-553	12191812	19	E	C

B15 Transmission Internal Mode Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	-	-	-	Not Occupied	-	-
B	0.5	BK	5981	Transmission Range Switch Signal A	I	-
C	0.5	BK	5981	Transmission Range Switch Signal B	I	-
D	0.5	BK	5983	Tranmission Range Switch Signal C	I	-
E	0.5	BK	4168	Transmission Range Switch Signal P	I	-
F	0.5	BK	3451	Ground	I	-
G	0.5	BK	3493	Park/Neutral Switch Signal	I	-
H	0.5	BK	3494	Internal Mode Switch Direction Signal R1	I	-
J	0.5	BK	3495	Internal Mode Switch Direction Signal R2	I	-
K	0.5	BK	3496	Internal Mode Switch Direction Signal D1	I	-
L	0.5	BK	3497	Internal Mode Switch Direction Signal D2	I	-
M	0.5	BK	3927	Internal Mode Switch Direction Signal – Start	I	-

B18 Battery Current Sensor



646415

Connector Part Information

Harness Type: Engine
OEM Connector: 15326808
Service Connector: 13580871
Description: 3-Way F 150 GT Series, Sealed (BK)

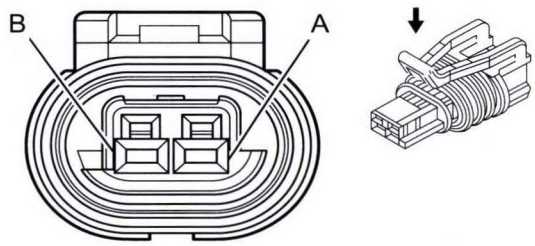
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B18 Battery Current Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	BU/VT	5076	Current Sensor Control	I	—
B	0.5	BK/VT	5077	Current Sensor Low Reference	I	—
C	0.5	WH/YE	5075	Current Sensor Signal	I	—

B20 Brake Fluid Level Switch



1538760

Connector Part Information

Harness Type: Body
OEM Connector: 15449028
Service Connector: 88987993
Description: 2-Way F 150 GT Series, Sealed (BK)

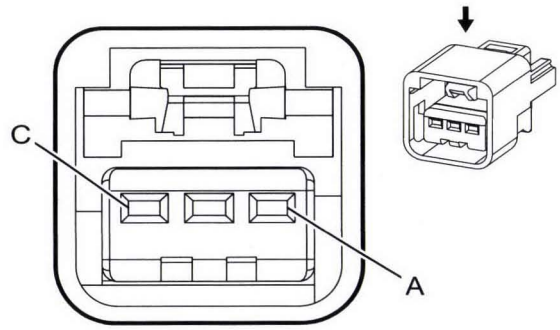
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B20 Brake Fluid Level Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	GN/GY	333	Brake Fluid Level Sensor Signal	I	—
B	0.5	BK	650	Ground	I	—

B22 Brake Pedal Position Sensor



1243663

Connector Part Information

Harness Type: Body
OEM Connector: 15332132
Service Connector: 88953364
Description: 3-Way F 150 GT Series (BK)

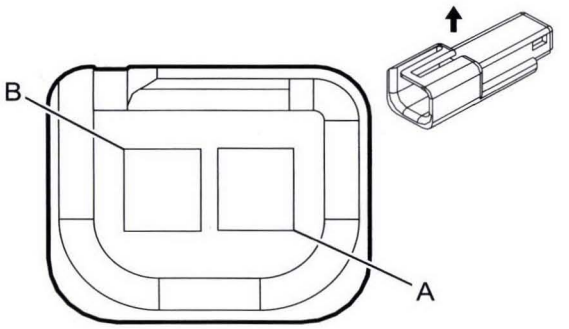
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B22 Brake Pedal Position Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.35	BK/BN	5360	Brake Apply Sensor Low Reference	I	—
B	0.35	BU/YE	5361	Brake Apply Sensor Signal	I	—
C	0.35	WH	5359	Brake Apply Sensor Control	I	—

B24 Cellular Phone Microphone



35441

Connector Part Information

Harness Type: Body
OEM Connector: 12047663
Service Connector: 13584278
Description: 2-Way M 150 Metri-Pack Series (BK)

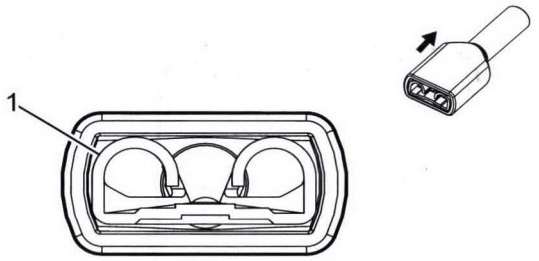
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-3 (GY)	Not Required	Not Required	Not Required	Not Required	Not Required

B24 Cellular Phone Microphone

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.35	BK/BN	654	Cellular Telephone Microphone Low Reference	I	-
B	0.35	BU	655	Cellular Telephone Microphone Signal	I	-

B28D Door Ajar Switch - Driver



2812272

Connector Part Information

Harness Type: Body
OEM Connector: ST730173-1
Service Connector: 19331439
Description: 1-Way F 250 Series

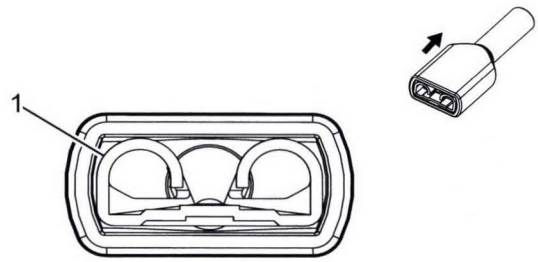
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B28D Door Ajar Switch - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GY	745	Left Front Door Ajar Switch Signal	I	—

B28LR Door Ajar Switch - Left Rear



2812272

Connector Part Information

Harness Type: Body
OEM Connector: ST730173-1
Service Connector: 19331439
Description: 1-Way F 250 Series

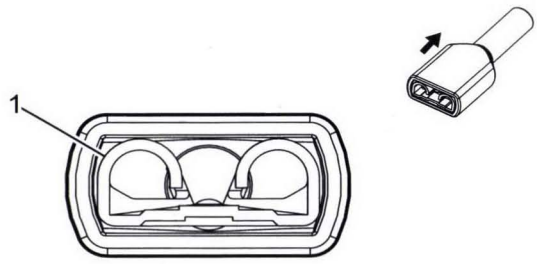
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B28LR Door Ajar Switch - Left Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GY	747	Left Rear Door Ajar Switch Signal	I	—

B28P Door Ajar Switch - Passenger



2812272

Connector Part Information

Harness Type: Body
OEM Connector: ST730173-1
Service Connector: 19331439
Description: 1-Way F 250 Series

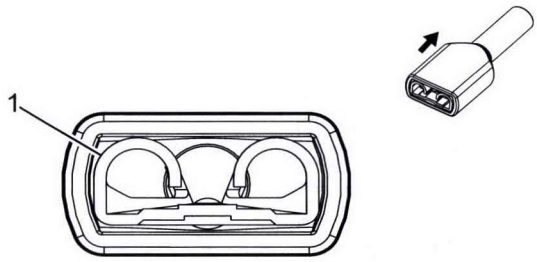
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B28P Door Ajar Switch - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GY	746	Right Front Door Ajar Switch Signal	I	—

B28RR Door Ajar Switch - Right Rear



2812272

Connector Part Information

Harness Type: Body
OEM Connector: ST730173-1
Service Connector: 19331439
Description: 1-Way F 250 Series

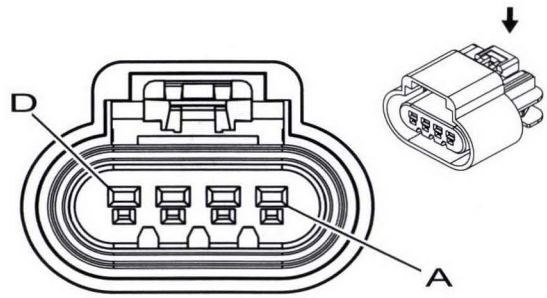
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B28RR Door Ajar Switch - Right Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GY	748	Right Rear Door Ajar Switch Signal	I	—

B30 Hybrid/EV Battery Pack Current Sensor



646430

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 15326815
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 4-Way F 150 GT Series, Sealed (BK)

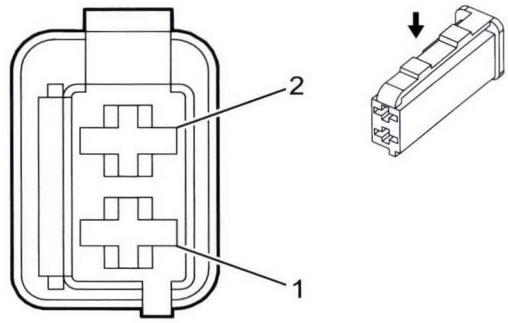
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B30 Hybrid/EV Battery Pack Current Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.35	D-BU/YE	2962	High Voltage Battery Current Sensor Course Signal	I	—
B	0.35	VT/RD	2965	High Voltage Battery Current Sensor Voltage Reference	I	—
C	0.35	BK/GY	2963	High Voltage Battery Current Sensor Low Reference	I	—
D	0.5	L-GN/BN	2961	High Voltage Battery Current Sensor Fine Signal	I	—

B32A Hybrid/EV Battery Temperature Sensor 1



2339593

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 13670097
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 1.6 Timer Series (BK)

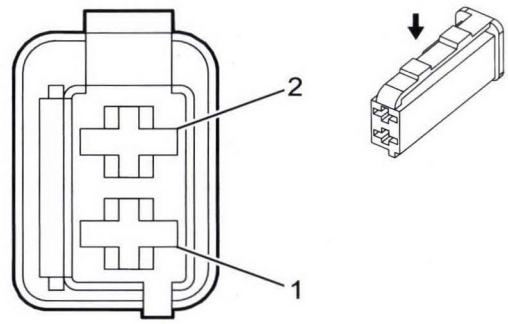
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B32A Hybrid/EV Battery Temperature Sensor 1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK/D-BU	5404	Charge Port Paddle Temperature Sensor Low Reference	I	—
2	0.5	D-BU	3373	Auxiliary Video High Signal (2)	I	—

B32B Hybrid/EV Battery Temperature Sensor 2



2339593

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 13670097
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 1.6 Timer Series (BK)

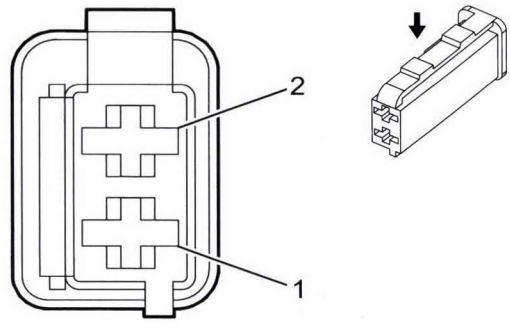
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B32B Hybrid/EV Battery Temperature Sensor 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BN/WH	5406	Battery Module Temperature Signal (2)	I	—
2	0.5	BK/D-BU	3774	Battery Module Temperature Sensor Low Reference (2)	I	—

B32C Hybrid/EV Battery Temperature Sensor 3



2339593

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 13670097
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 1.6 Timer Series (BK)

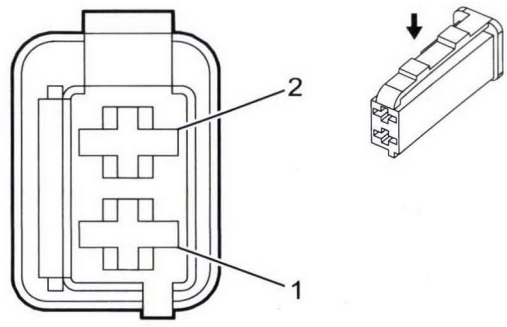
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B32C Hybrid/EV Battery Temperature Sensor 3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	L-GN/GY	5407	Battery Module Temperature Signal (3)	I	—
2	0.5	BK/L-GN	3775	Battery Module Temperature Sensor Low Reference (3)	I	—

B32D Hybrid/EV Battery Temperature Sensor 4



2339593

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 13670097
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 1.6 Timer Series (BK)

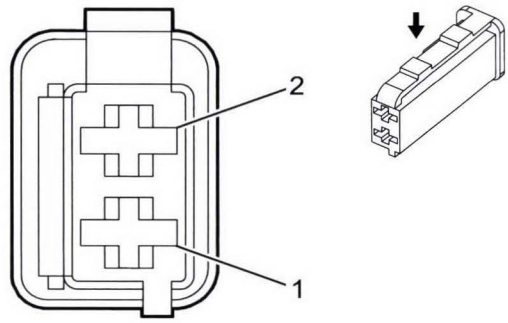
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B32D Hybrid/EV Battery Temperature Sensor 4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	WH/BK	5408	Battery Module Temperature Signal (4)	I	—
2	0.5	BK/YE	3778	Battery Module Temperature Sensor Low Reference (6)	I	—

B32E Hybrid/EV Battery Temperature Sensor 5



2339593

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 13670097
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 1.6 Timer Series (BK)

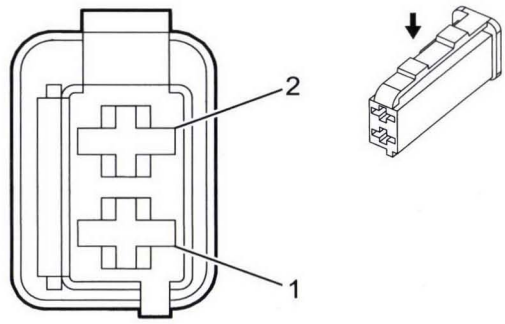
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B32E Hybrid/EV Battery Temperature Sensor 5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	L-GN/BK	5409	Battery Module Temperature Signal (5)	I	—
2	0.5	BK/VT	3777	Battery Module Temperature Sensor Low Reference (5)	I	—

B32F Hybrid/EV Battery Temperature Sensor 6



2339593

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 13670097
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 1.6 Timer Series (BK)

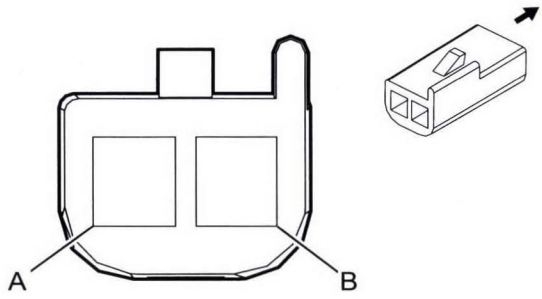
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B32F Hybrid/EV Battery Temperature Sensor 6

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GY/BN	5410	Battery Module Temperature Signal (6)	I	—
2	0.5	BK/YE	3778	Battery Module Temperature Sensor Low Reference (6)	I	—

B39 AC Evaporator Temperature Sensor



82383

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 12047662
Service Connector: 12085535
Description: 2-Way F Metri Pack 150 Series (BK)

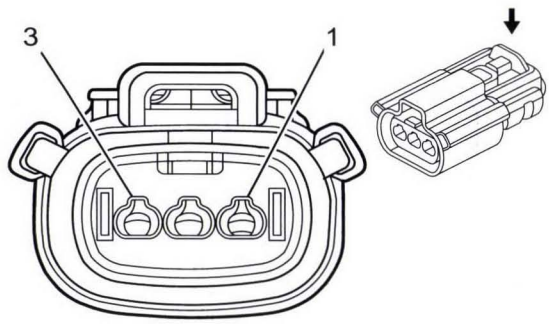
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575464	J-38125-12A	J-35616-14 (GN)	15326030	1	E	C

B39 AC Evaporator Temperature Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	BN/BU	6139	Evaporator Core Temperature Sensor Signal	I	C60
B	0.5	BN/GY	6138	EVAP Core Temperature Sensor Low Reference	I	C60

B55 Hood Ajar Switch



1862095

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 33471-0301
Service Connector: 19167749
Description: 3-Way F 1.5 Series, Sealed (BK)

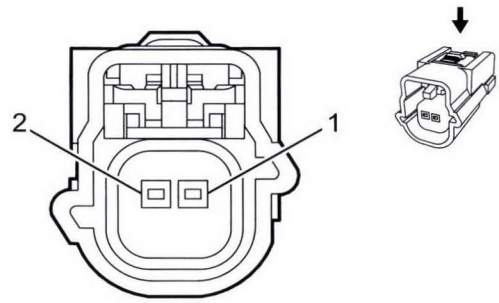
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-2A (GY)	Not Required	Not Required	Not Required	Not Required	Not Required

B55 Hood Ajar Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BN/GN	109	Hood Ajar Switch Signal	I	—
2	—	—	—	Not Occupied	—	-
3	0.5	BK	750	Ground	I	—

B59L Front Impact Sensor - Left



2179777

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 54390242
Service Connector: 13585852
Description: 2-Way F 0.64 Series, Sealed (D-GY)

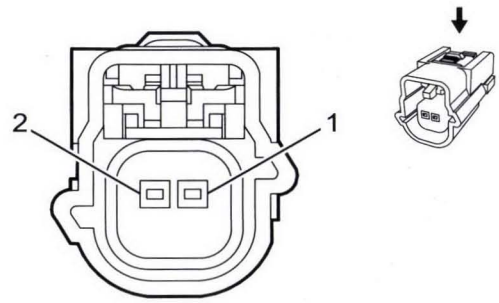
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B59L Front Impact Sensor - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/YE	354	Left Front Discriminating Sensor Signal	I	D9O+(AYF/AW7)
2	0.5	BK/OG	5045	Left Front Discriminating Sensor Low Reference	I	D9O+(AYF/AW7)

B59R Front Impact Sensor - Right



2179777

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 54390242
Service Connector: 13585852
Description: 2-Way F 0.64 Series, Sealed (D-GY)

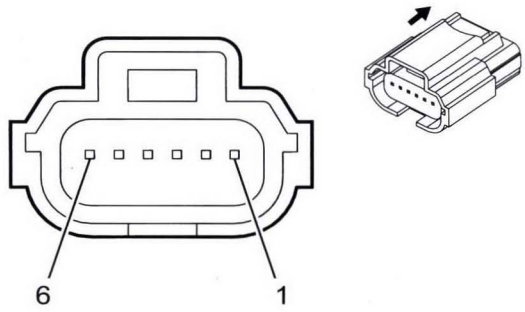
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B59R Front Impact Sensor - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/GN	1409	Right Front Discriminating Sensor Signal	I	D9O+(AYF/AW7)
2	0.5	BK/OG	5600	Right Front Discriminating Sensor Low Reference	I	D9O+(AYF/AW7)

B60 Passenger Presence Sensor (AW7)



2817419

Connector Part Information

Harness Type: Body
OEM Connector: 31403-6112
Service Connector: 19331704
Description: 6-Way F 0.64 Series, Sealed (BK)

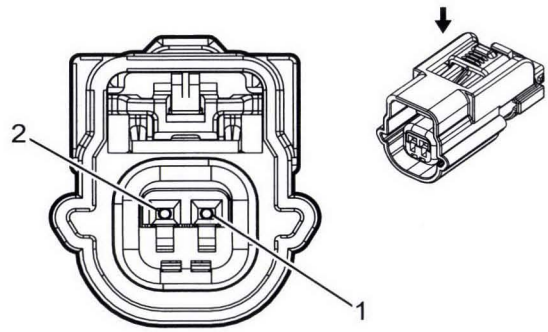
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B60 Passenger Presence Sensor (AW7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	RD/YE	740	Battery Positive Voltage	I	ALO
2	0.5	GN	5060	Low Speed GMLAN Serial Data	II	ALO
3	—	—	—	Not Occupied	—	-
4	0.35	BK	650	Ground	I	ALO
5	0.35	BU/RD	5612	Passenger Seat Belt Tension Sensor 5 Volt Reference	I	ALO
6	0.35	VT/OG	5611	Passenger Seat Belt Tension Sensor Signal	I	ALO

B63LF Side Impact Sensor - Left Front



3556418

Connector Part Information

Harness Type: Driver Door
OEM Connector: 54390240
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 0.64 Series, Sealed (L-GY)

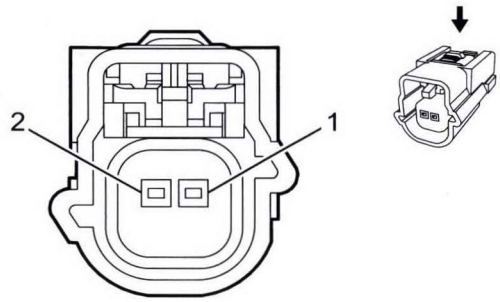
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B63LF Side Impact Sensor - Left Front

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/GN	2132	Left Front Side Impact Sensing Module Signal	I	(AYF/AW7)
2	0.5	BK/OG	6628	Left Front Side Impact Sensing Module Low Reference	I	(AYF/AW7)

B63LR Side Impact Sensor - Left Rear



2179777

Connector Part Information

Harness Type: Body
OEM Connector: 54390242
Service Connector: 13585852
Description: 2-Way F 0.64 Series, Sealed (D-GY)

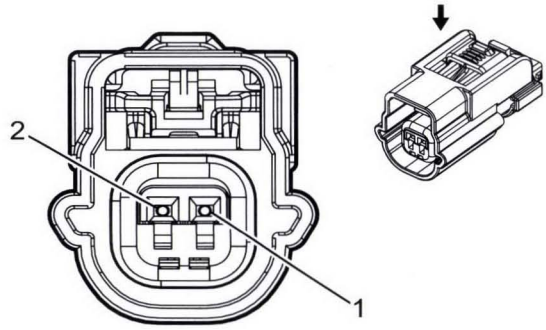
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B63LR Side Impact Sensor - Left Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/BU	6620	Left Middle Side Impact Sensing Module Signal	I	AYF/AW7
2	0.5	BK/OG	6621	Left Middle Side Impact Sensing Module Low Reference	I	AYF/AW7

B63RF Side Impact Sensor - Right Front



3556418

Connector Part Information

Harness Type: Passenger Door
OEM Connector: 54390240
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 0.64 Series, Sealed (L-GY)

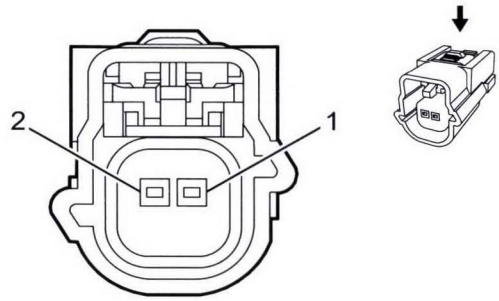
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B63RF Side Impact Sensor - Right Front

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BN/OG	2134	Right Front Side Impact Sensing Module Signal	I	(AYF/AW7)
2	0.5	BK/OG	6629	Right Front Side Impact Sensing Module Low Reference	I	(AYF/AW7)

B63RR Side Impact Sensor - Right Rear



2179777

Connector Part Information

Harness Type: Body
OEM Connector: 54390242
Service Connector: 13585852
Description: 2-Way F 0.64 Series, Sealed (D-GY)

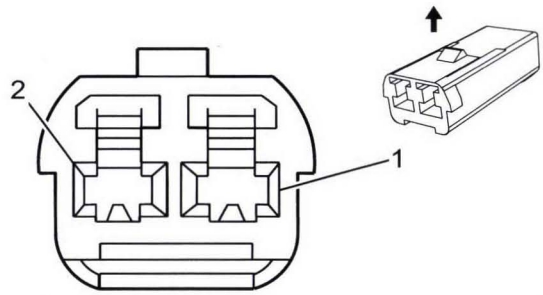
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B63RR Side Impact Sensor - Right Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/VT	6624	Right Middle Side Impact Sensing Module Signal	I	AYF/AW7
2	0.5	BK/OG	6625	Right Middle Side Impact Sensing Module Low Reference	I	AYF/AW7

B69 Liftgate Ajar Switch



1413061

Connector Part Information

Harness Type: Liftgate
OEM Connector: MG610070
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 250 Series (NA)

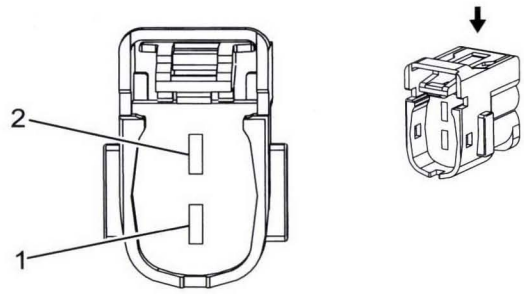
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-18 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B69 Liftgate Ajar Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK	1150	Ground	I	—
2	0.5	VT/GY	1303	Lift Gate Ajar Switch Signal (1)	I	—

B78G Rear Object Sensor - Left Outer (UD7)



2268775

Connector Part Information

Harness Type: Back up Alarm
OEM Connector: MG642273-5
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 090 Series, Sealed (BK)

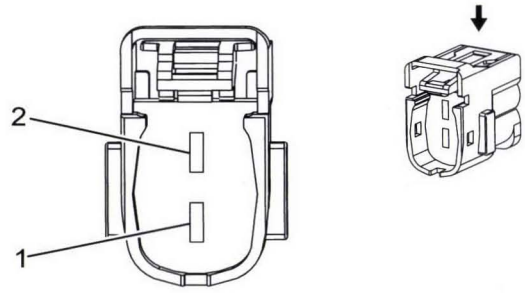
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-18 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B78G Rear Object Sensor - Left Outer (UD7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	YE	2375	Left Rear Corner Object Sensor Signal	I	UD7
2	0.5	BK/GY	2379	Object Sensor Low Reference	I	UD7

B78H Rear Object Sensor - Right Outer (UD7)



2268775

Connector Part Information

Harness Type: Back up Alarm
OEM Connector: MG642273-5
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 090 Series, Sealed (BK)

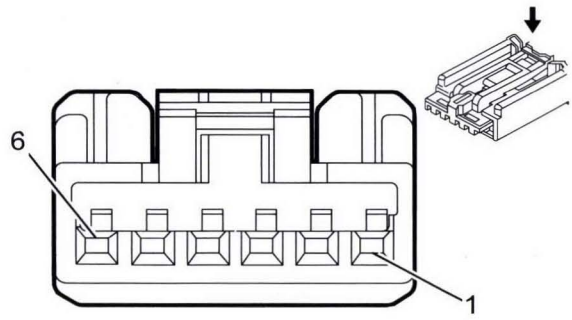
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-18 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B78H Rear Object Sensor - Right Outer (UD7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	YE/VT	2378	Right Rear Corner Object Sensor Signal	I	UD7
2	0.5	BK/GY	2379	Object Sensor Low Reference	I	UD7

B87 Rearview Camera (UV7)



1862240

Connector Part Information

Harness Type: Liftgate
OEM Connector: AIT2PB-06-1AK
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 6-Way F 0.64 Kaizen Series (BK)

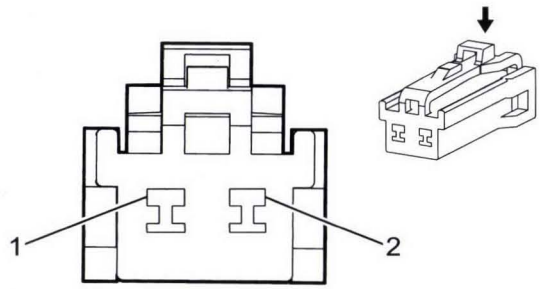
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B87 Rearview Camera (UV7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GY/YE	6972	Camera Signal 2 +	I	UVC
2	0.5	BK/WH	651	Signal Ground	I	UVC
3	0.5	GN/WH	24	Backup Lamp Control	I	UVC
4	0.5	WH/BU	6973	Camera Signal 2	I	UVC
5	0.35	BK	1250	Ground	II	UVC
6	0.5	VT/BN	841	Run Ignition 3 Voltage	I	UVC

B88D Seat Belt Switch - Driver (AYF/AW7)



2268758

Connector Part Information

Harness Type: Body
OEM Connector: MG610392
Service Connector: 13577006
Description: 2-Way F

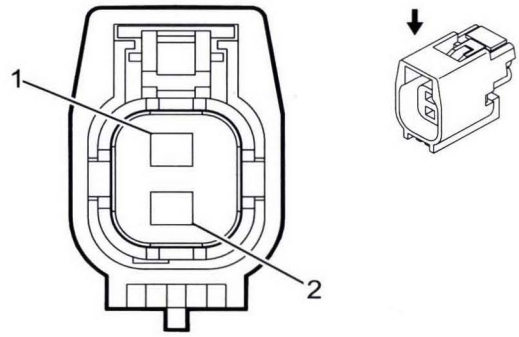
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-42 (RD)	Not Required	Not Required	Not Required	Not Required	Not Required

B88D Seat Belt Switch - Driver (AYF/AW7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK/OG	1363	Driver Seat Belt Switch Low Reference	I	AYF/AW7
2	0.5	OG/BN	238	Driver Seat Belt Switch Signal	I	AYF/AW7

B88P Seat Belt Switch - Passenger (AW7)



2152684

Connector Part Information

Harness Type: Body
OEM Connector: 7287-0973-30
Service Connector: 13586115
Description: 2-Way F GT 1.5 Series Sealed (BK)

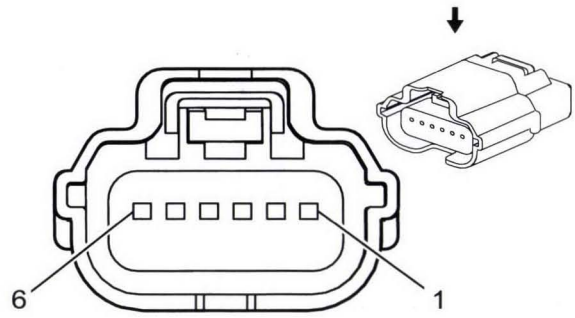
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-64B (L-BU)	Not Available	Not Available	Not Available	Not Available	Not Available

B88P Seat Belt Switch - Passenger (AW7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	BK/OG	1361	Passenger Seat Belt Switch Low Reference	I	-AL0
2	0.5	OG/VT	1362	Passenger Seat Belt Switch Signal	I	-AL0

B107 Accelerator Pedal Position Sensor



1974974

Connector Part Information

Harness Type: Body
OEM Connector: 31404-6110
Service Connector: 13577043
Description: 6-Way F 0.64 Series, Sealed (NA)

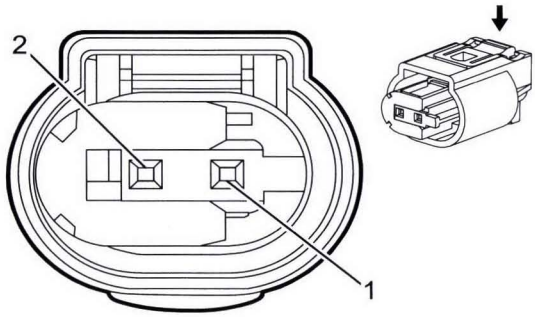
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B107 Accelerator Pedal Position Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BN/RD	1274	Accelerator Pedal Position 5 Volt Reference (2)	I	—
2	0.5	GN/WH	1162	Accelerator Pedal Position Signal (2)	I	—
3	0.5	BK/VT	1272	Accelerator Pedal Position Low Reference (2)	I	—
4	0.5	BK/BU	1271	Accelerator Pedal Position Low Reference (1)	I	—
5	0.5	YE/WH	1161	Accelerator Pedal Position Signal (1)	I	—
6	0.5	WH/RD	1164	Accelerator Pedal Position 5 Volt Reference (1)	I	—

B135 Coolant Heater Temperature Sensor



1869767

Connector Part Information

Harness Type: Engine
OEM Connector: 1-967644-1
Service Connector: 13576533
Description: 2-Way F 0.64 Micro-Quadlock Series, Sealed (BK with GN Terminal Position Assurance)

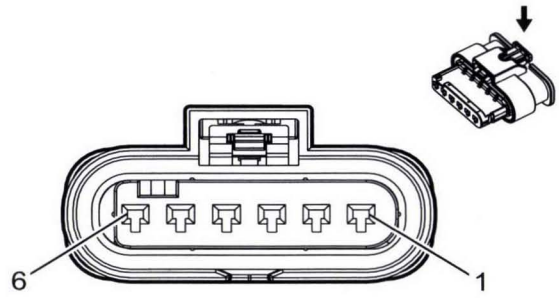
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B135 Coolant Heater Temperature Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GN	36	Coolant Temperature Signal	I	—
2	0.5	BK/BN	6102	Inside Air Temperature Sensor Low Reference	I	—

B153P Seat Belt Buckle - Passenger (AYF)



2717165

Connector Part Information

Harness Type: Body
OEM Connector: 1-2141530-5
Service Connector: 19300377
Description: 6-Way F 1.2 Multiple Contact Point Series, Sealed (YE)

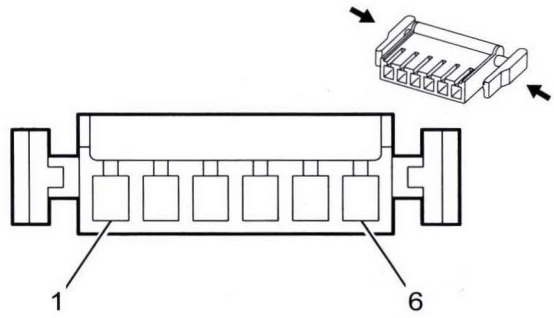
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B153P Seat Belt Buckle - Passenger (AYF)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK/OG	1361	Passenger Seat Belt Switch Low Reference	I	ALO+TFC +(AYF/AW7)
2	0.5	OG/VT	1362	Passenger Seat Belt Switch Signal	II	ALO+TFC +(AYF/AW7)
3	0.35	VT/OG	5611	Passenger Seat Belt Tension Sensor Signal	I	ALO
4	0.35	BK/OG	5613	Passenger Seat Belt Tension Sensor Low Reference	I	ALO
5	0.35	BU/RD	5612	Passenger Seat Belt Tension Sensor 5 Volt Reference	I	ALO
6	—	—	—	Not Occupied	—	—

B160 Windshield Temperature and Inside Moisture Sensor



2173602

Connector Part Information

Harness Type: Body
OEM Connector: 13726957
Service Connector: 13576539
Description: 6-Way F 0.64 Micro-Quadlock Series (BK)

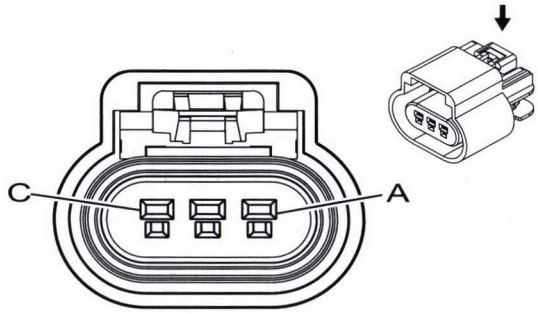
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B160 Windshield Temperature and Inside Moisture Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	YE/RD	597	5 Volt Reference	I	—
2	0.35	GY/GN	7565	Windscreen Temp Sensor Signal	I	—
3	0.35	BK/BN	6102	Inside Air Temperature Sensor Low Reference	I	—
4	0.35	GY/BU	7564	Humidity Sensor Signal	I	—
5	0.35	YE/BU	3197	Humidity Temperature Sensor Signal	I	—
6	—	—	—	Not Occupied	—	—

B197 Charge Port Door Position Switch



646415

Connector Part Information

Harness Type: Battery Charger Receptacle
OEM Connector: 13519047
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 3-Way F 150 GT Series, Sealed (BK)

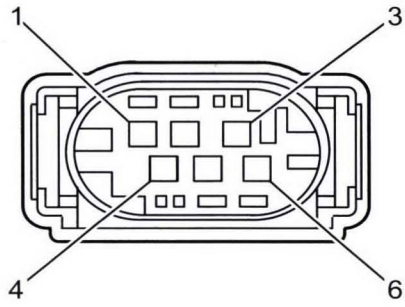
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B197 Charge Port Door Position Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.75	WH/D-BU	3697	Charge Port Door Sensor Signal	I	—
B	—	—	—	Not Occupied	—	-
C	0.75	BK	750	Ground	I	—

B201 Brake Control Brake Pedal Position Sensor



831393

Connector Part Information

Harness Type: Body
OEM Connector: 1-967616-1
Service Connector: 15306420
Description: 6-Way F 0.64 Micro-Quadlock Series, Sealed (BK)

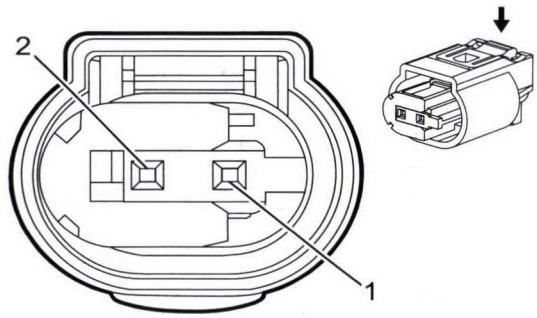
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B201 Brake Control Brake Pedal Position Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	BK/GY	3417	Brake Pedal Travel Sensor 1 Low Reference	I	—
2 - 3	—	—	—	Not Occupied	—	-
4	0.35	BU/YE	3334	Brake Pedal Travel Sensor 1 Signal	I	—
5	0.35	BU/RD	3335	Brake Pedal Travel Sensor 1 High Reference	I	—
6	0.35	VT/BN	3333	Brake Pedal Travel Sensor 2 Signal	I	—

B202 Hybrid Electronics Coolant Temperature Sensor



1869767

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 1-967644-1
Service Connector: 13576533
Description: 2-Way F 0.64 Micro-Quadlock Series, Sealed (BK with GN Terminal Position Assurance)

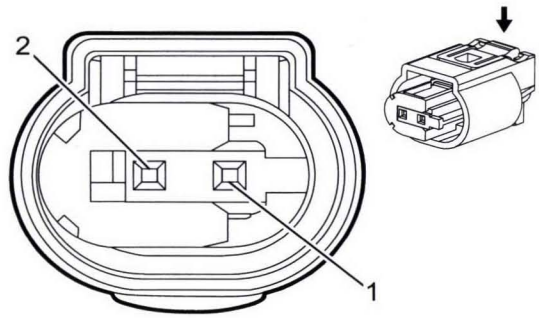
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

B202 Hybrid Electronics Coolant Temperature Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GN/VT	2032	Coolant Temperature Sensor Signal	I	—
2	0.5	BK/YE	407	Sensor Low Reference	I	—

B204A Hybrid/EV Battery Pack Coolant Temperature Sensor 1



1869767

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 15365708
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 0.64 Micro-Quadlock Series, Sealed (BK)

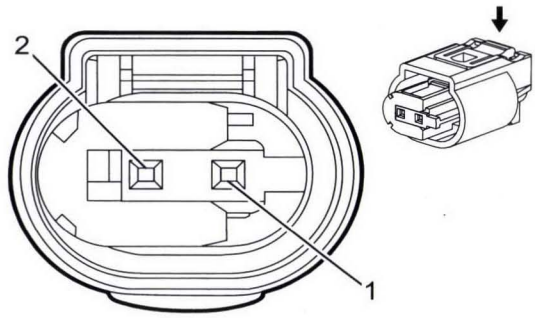
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B204A Hybrid/EV Battery Pack Coolant Temperature Sensor 1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	YE	5411	Battery Module Temperature Signal (7)	I	—
2	0.5	BK/D-BU	3779	Battery Module Temperature Sensor Low Reference (7)	I	—

B204B Hybrid/EV Battery Pack Coolant Temperature Sensor 2



1869767

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 15365708
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 0.64 Micro-Quadlock Series, Sealed (BK)

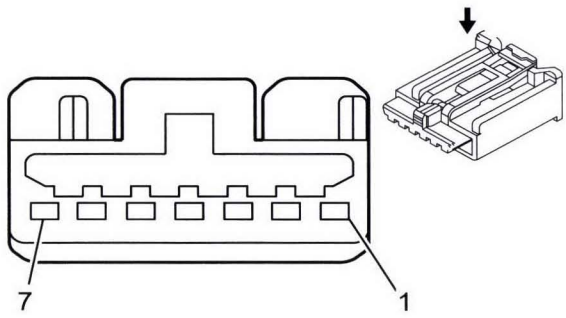
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

B204B Hybrid/EV Battery Pack Coolant Temperature Sensor 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	VT	5412	Battery Module Temperature Signal (8)	I	—
2	0.5	BK/L-GN	3780	Battery Module Temperature Sensor Low Reference (8)	I	—

B228 Drive Motor Position Sensor



1847927

Connector Part Information

Harness Type: Internal Transmission
OEM Connector: AIT2PB-07-1FS
Service Connector: Service by Harness – See Part Catalog
Description: 7-Way F AIT II Series (NA)

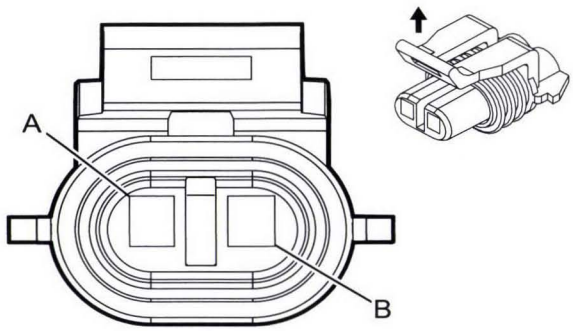
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	J-35616-64B (L-BU)	J-38125-215A	SAIT-A03T-M064	14	P	P

B228 Drive Motor Position Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK	3486	Traction Power Inverter Module Resolver #2 Excitation Signal Positive	I	—
2	0.5	BK	3485	Traction Power Inverter Module Resolver #2 Excitation Signal Negitive	I	—
3	0.5	BK	3491	Traction Power Inverter Module Resolver #2 S2 Signal	I	—
4	0.5	BK	3492	Traction Power Inverter Module Resolver #2 S4 Signal	I	—
5	0.5	BK	3487	Traction Power Inverter Module Resolver #2 S3 Signal	I	—
6	0.5	BK	3488	Traction Power Inverter Module Resolver #2 S1 Signal	I	—
7	-	-	-	Not Occupied	-	-

B258 Hybrid/EV Battery Coolant Level Switch



635009

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 12052641
Service Connector: 13586114
Description: 2-Way F 150 Metri-Pack Series (BK)

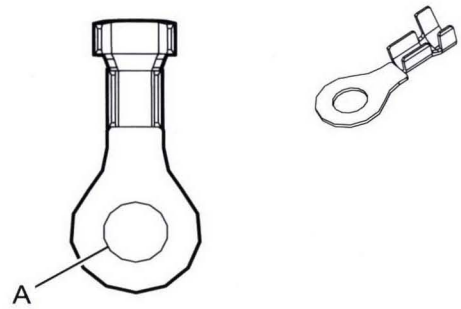
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

B258 Hybrid/EV Battery Coolant Level Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	BN	1797	Coolant Level Sensor Signal	I	—
B	0.5	BK/BN	1798	Low Reference	I	—

C1 Battery (-)



2268796

Connector Part Information

Harness Type: Battery Cable
OEM Connector: ST710211–2
Service Connector: Service by Harness - See Part Catalog
Description: 1-Way Ring Terminal (NA)

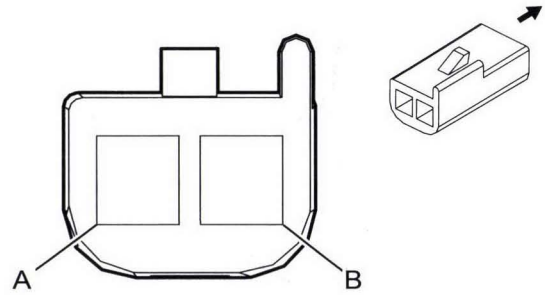
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

C1 Battery (-)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	25	BK	250	Ground	I	—

C3 Telematics Communication Interface Control Module Battery (UE1)



82383

Connector Part Information

Harness Type: Body
OEM Connector: 12047662
Service Connector: 12085535
Description: 2-Way F 150 Metri-Pack Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

C3 Telematics Communication Interface Control Module Battery (UE1)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	YE/VT	5235	Battery Backup Control	I	UE1
B	0.5	BK/VT	5167	Battery Backup Low Reference	I	UE1

C4A Hybrid/EV Battery Section 1

—

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 15345479
Service Connector: Service by Harness - See Part Catalog
Description: 18 Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327166	J-35616-65B (L-BU)	J-38125-12A	963716-2	7	H	H

C4A Hybrid/EV Battery Section 1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	VT	5391	Battery Voltage Signal (1)	I	-
2	0.35	WH	5395	Battery Voltage Signal (3)	I	-
3	0.35	YE/L-GN	5397	Battery Voltage Signal (5)	I	-
4	0.35	YE/BN	5399	Battery Voltage Signal (7)	I	-
5	0.35	L-GN/BK	5401	Battery Voltage Signal (9)	I	-
6	0.35	L-GN/GY	5393	Battery Voltage Signal (11)	I	-
7	0.35	YE/GY	5572	Battery Voltage Signal (13)	I	-
8	0.35	WH/BK	5574	Battery Voltage Signal (15)	I	-
9	-	-	-	Not Occupied	-	-
10	0.35	BK/VT	5403	Battery Pack Monitor Low Reference	I	-
11	0.35	YE/VT	5394	Battery Voltage Signal (2)	I	-
12	0.35	GY/YE	5396	Battery Voltage Signal (4)	I	-
13	0.35	L-GN	5398	Battery Voltage Signal (6)	I	-
14	0.35	D-BU	5400	Battery Voltage Signal (8)	I	-
15	0.35	D-BU/GY	5392	Battery Voltage Signal (10)	I	-
16	0.35	BN	5571	Battery Voltage Signal (12)	I	-
17	0.35	YE	5573	Battery Voltage Signal (14)	I	-
18	0.35	BN/WH	5575	Battery Voltage Signal (16)	I	-

C4B Hybrid/EV Battery Section 2

—

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 15345479
Service Connector: Service by Harness - See Part Catalog
Description: 18 Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327166	J-35616-65B (L-BU)	J-38125-12A	963716-2	7	H	H

C4B Hybrid/EV Battery Section 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	WH/D-BU	5576	Battery Voltage Signal (17)	I	-
2	0.35	L-GN/WH	5578	Battery Voltage Signal (19)	I	-
3	0.35	L-GN/BN	5580	Battery Voltage Signal (21)	I	-
4	0.35	GY/BK	5582	Battery Voltage Signal (23)	I	-
5	0.35	VT/WH	5584	Battery Voltage Signal (25)	I	-
6	0.35	D-BU/BK	5586	Battery Voltage Signal (27)	I	-
7	0.35	YE/WH	5588	Battery Voltage Signal (29)	I	-
8	0.35	L-GN/BK	5590	Battery Voltage Signal (31)	I	-
9	-	-	-	Not Occupied	-	-
10	0.35	BN/WH	5575	Battery Voltage Signal (16)	I	-
11	0.35	L-GN/VT	5577	Battery Voltage Signal (18)	I	-
12	0.35	YE/BK	5579	Battery Voltage Signal (20)	I	-
13	0.35	D-BU/WH	5581	Battery Voltage Signal (22)	I	-
14	0.35	WH/BK	5583	Battery Voltage Signal (24)	I	-
15	0.35	GY/L-GN	5585	Battery Voltage Signal (26)	I	-
16	0.35	GY/BK	5587	Battery Voltage Signal (28)	I	-
17	0.35	VT/L-GN	5589	Battery Voltage Signal (30)	I	-
18	0.35	GY	5591	Battery Voltage Signal (32)	I	-

C4C Hybrid/EV Battery Section 3

—

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 15345479
Service Connector: Service by Harness - See Part Catalog
Description:18 Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327166	J-35616-65B (L-BU)	J-38125-12A	963716-2	7	H	H

C4C Hybrid/EV Battery Section 3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GY/WH	5592	Battery Voltage Signal (33)	I	-
2	0.35	BK/VT	4516	Battery Cell Voltage Signal (35)	I	-
3	0.35	YE/VT	4518	Battery Cell Voltage Signal (37)	I	-
4	0.35	GY/YE	4520	Battery Cell Voltage Signal (39)	I	-
5	0.35	L-GN	4522	Battery Cell Voltage Signal (41)	I	-
6	0.35	D-BU	4524	Battery Cell Voltage Signal (43)	I	-
7	0.35	D-BU/GY	4526	Battery Cell Voltage Signal (45)	I	-
8	0.35	BN	4528	Battery Cell Voltage Signal (47)	I	-
9	-	-	-	Not Occupied	-	-
10	0.35	GY	5591	Battery Voltage Signal (32)	I	-
11	0.35	VT/BK	4514	Battery Cell Voltage Signal (34)	I	-
12	0.35	VT	4517	Battery Cell Voltage Signal (36)	I	-
13	0.35	WH	4519	Battery Cell Voltage Signal (38)	I	-
14	0.35	YE/L-GN	4521	Battery Cell Voltage Signal (40)	I	-
15	0.35	YE/BN	4523	Battery Cell Voltage Signal (42)	I	-
16	0.35	L-GN/BK	4525	Battery Cell Voltage Signal (44)	I	-
17	0.35	L-GN/GY	4527	Battery Cell Voltage Signal (46)	I	-
18	0.35	YE/GY	4529	Battery Cell Voltage Signal (48)	I	-

C4D Hybrid/EV Battery Section 4

—

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 15345479
Service Connector: Service by Harness - See Part Catalog
Description: 18 Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327166	J-35616-65B (L-BU)	J-38125-12A	963716-2	7	H	H

C4D Hybrid/EV Battery Section 4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	YE	4530	Battery Cell Voltage Signal (49)	I	-
2	0.35	BN/WH	4532	Battery Cell Voltage Signal (51)	I	-
3	0.35	WH/D-BU	4535	Battery Cell Voltage Signal (53)	I	-
4	0.35	L-GN/WH	4537	Battery Cell Voltage Signal (55)	I	-
5	0.35	GY/BN	4541	Battery Cell Voltage Signal (57)	I	-
6	0.35	GY/BK	4544	Battery Cell Voltage Signal (59)	I	-
7	0.35	VT/WH	4546	Battery Cell Voltage Signal (61)	I	-
8	0.35	D-BU/BK	4548	Battery Cell Voltage Signal (63)	I	-
9	-	-	-	Not Occupied	-	-
10	0.35	YE/GY	4529	Battery Cell Voltage Signal (48)	I	-
11	0.35	WH/BK	4531	Battery Cell Voltage Signal (50)	I	-
12	0.35	D-BU/YE	4533	Battery Cell Voltage Signal (52)	I	-
13	0.35	L-GN/VT	4536	Battery Cell Voltage Signal (54)	I	-
14	0.35	YE/BK	4538	Battery Cell Voltage Signal (56)	I	-
15	0.35	D-BU/WH	4543	Battery Cell Voltage Signal (58)	I	-
16	0.35	WH/BK	4545	Battery Cell Voltage Signal (60)	I	-
17	0.35	GY/L-GN	4547	Battery Cell Voltage Signal (62)	I	-
18	0.35	GY/BK	4549	Battery Cell Voltage Signal (64)	I	-

C4E Hybrid/EV Battery Section 5

—

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 15345479
Service Connector: Service by Harness - See Part Catalog
Description: 18 Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327166	J-35616-65B (L-BU)	J-38125-12A	963716-2	7	H	H

C4E Hybrid/EV Battery Section 5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	YE/WH	4553	Battery Cell Voltage Signal (65)	I	-
2	0.35	L-GN/BK	4555	Battery Cell Voltage Signal (67)	I	-
3	0.35	GY/WH	4557	Battery Cell Voltage Signal (69)	I	-
4	0.35	BK/VT	4560	Battery Cell Voltage Signal (71)	I	-
5	0.35	YE/VT	4562	Battery Cell Voltage Signal (73)	I	-
6	0.35	GY/YE	4564	Battery Cell Voltage Signal (75)	I	-
7	0.35	L-GN	4566	Battery Cell Voltage Signal (77)	I	-
8	0.35	D-BU	4568	Battery Cell Voltage Signal (79)	I	-
9	-	-	-	Not Occupied	-	-
10	0.35	GY/BK	4549	Battery Cell Voltage Signal (64)	I	-
11	0.35	VT/L-GN	4554	Battery Cell Voltage Signal (66)	I	-
12	0.35	GY	4556	Battery Cell Voltage Signal (68)	I	-
13	0.35	VT/BK	4558	Battery Cell Voltage Signal (70)	I	-
14	0.35	VT	4561	Battery Cell Voltage Signal (72)	I	-
15	0.35	WH	4563	Battery Cell Voltage Signal (74)	I	-
16	0.35	YE/L-GN	4565	Battery Cell Voltage Signal (76)	I	-
17	0.35	YE/BN	4567	Battery Cell Voltage Signal (78)	I	-
18	0.35	L-GN/BK	4569	Battery Cell Voltage Signal (80)	I	-

C4F Hybrid/EV Battery Section 6

—

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 15345479
Service Connector: Service by Harness - See Part Catalog
Description: 18 Way

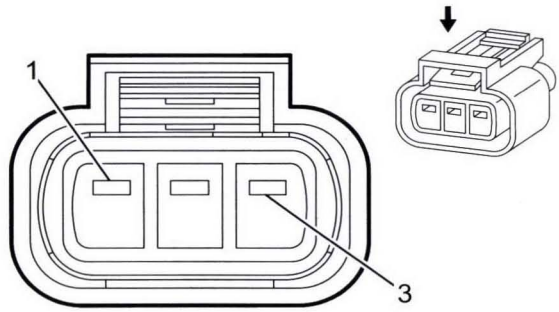
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327166	J-35616-65B (L-BU)	J-38125-12A	963716-2	7	H	H

C4F Hybrid/EV Battery Section 6

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	D-BU/GY	4570	Battery Cell Voltage Signal (81)	I	-
2	0.35	BN	4572	Battery Cell Voltage Signal (83)	I	-
3	0.35	YE	4574	Battery Cell Voltage Signal (85)	I	-
4	0.35	BN/WH	4576	Battery Cell Voltage Signal (87)	I	-
5	0.35	BN/WH	2389	Battery Cell Voltage Signal (89)	I	-
6	0.35	L-GN/VT	2391	Battery Cell Voltage Signal (91)	I	-
7	0.35	YE/VT	2393	Battery Cell Voltage Signal (93)	I	-
8	0.35	D-BU/GY	2395	Battery Cell Voltage Signal (95)	I	-
9	-	-	-	Not Occupied	-	-
10	0.35	L-GN/BK	4569	Battery Cell Voltage Signal (80)	I	-
11	0.35	L-GN/GY	4571	Battery Cell Voltage Signal (82)	I	-
12	0.35	YE/GY	4573	Battery Cell Voltage Signal (84)	I	-
13	0.35	WH/BK	4575	Battery Cell Voltage Signal (86)	I	-
14	0.35	D-BU/YE	4577	Battery Cell Voltage Signal (88)	I	-
15	0.35	WH/BK	2390	Battery Cell Voltage Signal (90)	I	-
16	0.35	D-BU/BK	2392	Battery Cell Voltage Signal (92)	I	-
17	0.35	L-GN/BK	2394	Battery Cell Voltage Signal (94)	I	-
18	0.35	GY/YE	2396	Battery Cell Voltage Signal (96)	I	-

E4N Park/Turn Signal Lamp - Left (CW1)



1830929

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 936187-3
Service Connector: 13577844
Description: 3-Way F 090 Series, Sealed (GY)

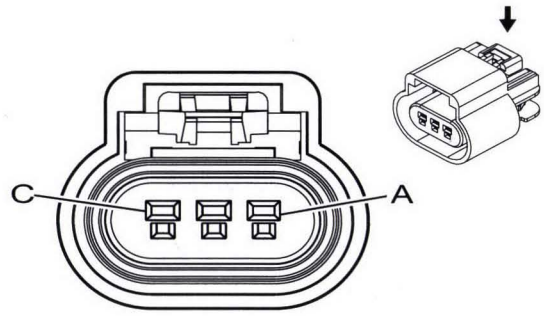
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-18 (BK)	Not Required	Not Required	Not Required	Not Required	Not Required

E4N Park/Turn Signal Lamp - Left (CW1)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BU/WH	1314	Left Front Turn Signal Lamp Control	I	CW1
2	0.5	BK	50	Ground	I	CW1
3	0.5	VT/GY	709	Left Park Lamp Control	I	CW1

E4N Park/Turn Signal Lamp - Left (EF7/Z49)



646415

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 15326808
Service Connector: 13580871
Description: 3-Way F 150 GT Series, Sealed (BK)

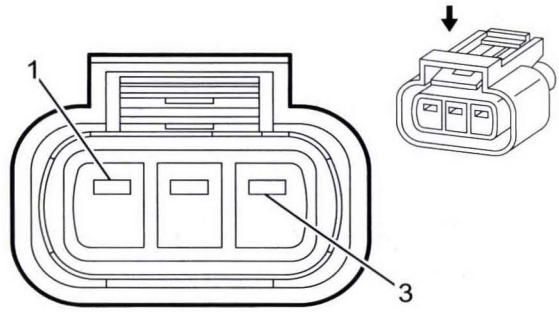
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

E4N Park/Turn Signal Lamp - Left (EF7/Z49)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	BU/WH	1314	Left Front Turn Signal Lamp Control	I	EF7/Z49
B	0.5	VT/GY	709	Left Park Lamp Control	I	EF7/Z49
C	0.5	BK	50	Ground	I	EF7/Z49

E4P Park Turn Signal Lamp - Right (CW1)



1830929

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 936187-3
Service Connector: 13577844
Description: 3-Way F 090 Series, Sealed (GY)

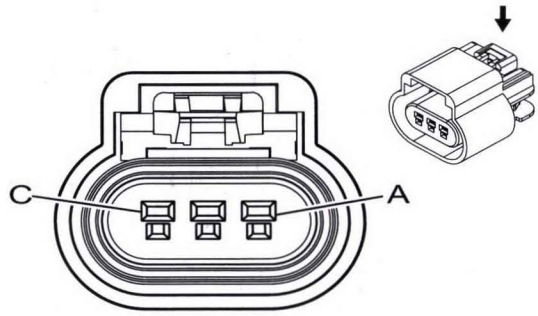
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-18 (BK)	Not Required	Not Required	Not Required	Not Required	Not Required

E4P Park Turn Signal Lamp - Right (CW1)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GN/VT	1315	Right Front Turn Signal Lamp Control	I	CW1
2	0.5	BK	150	Ground	I	CW1
3	0.5	GY/BN	309	Right Park Lamp Control	I	CW1

E4P Park Turn Signal Lamp - Right (EF7/Z49)



646415

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 15326808
Service Connector: 13580871
Description: 3-Way F 150 GT Series, Sealed (BK)

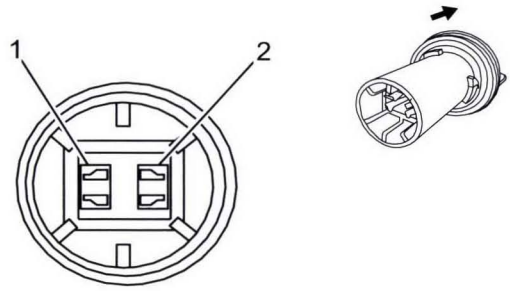
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

E4P Park Turn Signal Lamp - Right (EF7/Z49)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	GN/VT	1315	Right Front Turn Signal Lamp Control	I	EF7/Z49
B	0.5	GY/BN	309	Right Park Lamp Control	I	EF7/Z49
C	0.5	BK	150	Ground	I	EF7/Z49

E5A Backup Lamp - Left



2220535

Connector Part Information

Harness Type: Tail Lamp - Left
OEM Connector: 2608
Service Connector: Service by Harness - See Part Catalog
Description: 2-Way F Bulb Socket (GY)

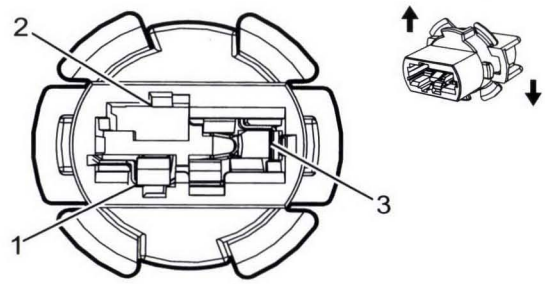
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	Not Available	Not Available	Service by Harness – See Part Catalog	Not Avail-able	Not Avail-able	Not Avail-able

E5A Backup Lamp - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	WH	24	Backup Lamp Supply Voltage	I	-
2	0.5	BK/WH	550	Ground	I	-

E5AA Tail/Stop Lamp - Left



2844184

Connector Part Information

Harness Type: Tail Lamp - Left
OEM Connector: 5098–5100
Service Connector: Service by Harness – See Part Catalog
Description: 3-Way F Lamp Socket (BK), Sealed

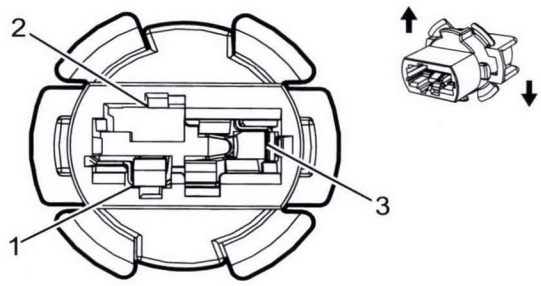
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	Not Available	Not Available	Service by Harness – See Part Catalog	Not Available	Not Available	Not Available

E5AA Tail/Stop Lamp - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BU	7542	Left Rear Stop Lamp Supply Voltage	I	—
2	0.5	BK	1150	Ground	I	—
3	0.5	RD	709	Left Park Lamp Supply Voltage	I	—

E5AB Tail/Stop Lamp - Right



2844184

Connector Part Information

Harness Type: Tail Lamp - Right
OEM Connector: 5098–5100
Service Connector: Service by Harness – See Part Catalog
Description: 3-Way F Lamp Socket (BK), Sealed

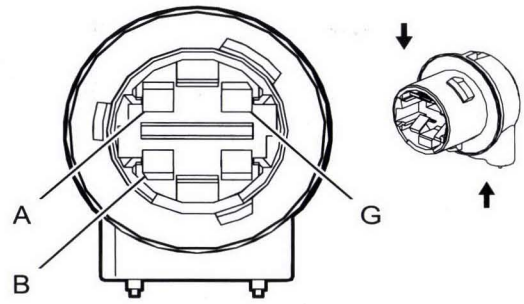
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	Not Available	Not Available	Service by Harness – See Part Catalog	Not Avail-able	Not Avail-able	Not Avail-able

E5AB Tail/Stop Lamp - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BU	7541	Right Rear Stop Lamp Supply Voltage	I	—
2	0.5	BK	950	Ground	I	—
3	0.5	RD	309	Right Park Lamp Supply Voltage	I	—

E5AC Tail/Turn Signal Lamp - Left



2339611

Connector Part Information

Harness Type: Tail Lamp - Left
OEM Connector: 992-4050-079
Service Connector: Service by Harness – See Part Catalog
Description: 3-Way F Sealed (BK)

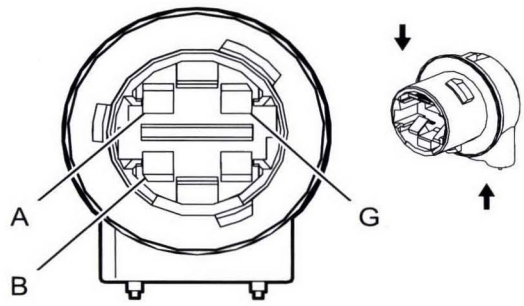
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	Not Available	Not Available	Service by Harness – See Part Catalog	Not Avail-able	Not Avail-able	Not Avail-able

E5AC Tail/Turn Signal Lamp - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	YE	1334	Left Rear Turn Signal Lamp Supply Voltage	I	—
B	0.5	BU	709	Left Park Lamp Supply Voltage	I	–
G	0.5	BK	1150	Ground	I	—

E5AD Tail/Turn Signal Lamp - Right



2339611

Connector Part Information

Harness Type: Tail Lamp - Right
OEM Connector: 992-4050-079
Service Connector: Service by Harness – See Part Catalog
Description: 3-Way F Sealed, (BK)

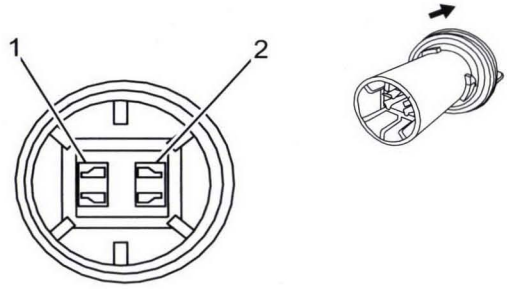
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	Not Available	Not Available	Service by Harness – See Part Catalog	Not Available	Not Available	Not Available

E5AD Tail/Turn Signal Lamp - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	YE	1335	Right Rear Turn Signal Lamp Supply Voltage	I	—
B	0.5	BU	309	Right Park Lamp Supply Voltage	I	—
G	0.5	BK	950	Ground	I	—

E5B Backup Lamp - Right



2220535

Connector Part Information

Harness Type: Tail Lamp - Right
OEM Connector: 2608
Service Connector: Service by Harness - See Part Catalog
Description: 2-Way F Bulb Socket (GY)

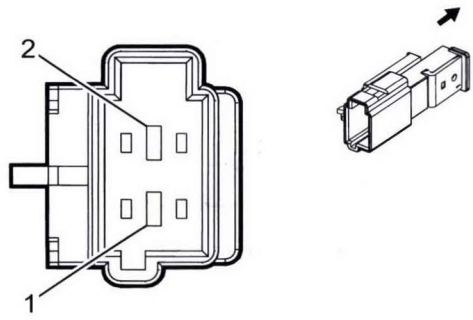
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	Not Available	Not Available	Service by Harness – See Part Catalog	Not Avail-able	Not Avail-able	Not Avail-able

E5B Backup Lamp - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	WH	24	Backup Lamp Supply Voltage	I	-
2	0.5	BK/WH	550	Ground	I	-

E6 Center High Mounted Stop Lamp



2339581

Connector Part Information

Harness Type: Liftgate
OEM Connector: 1563190-1
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way M 1.6 Timer Series (BK)

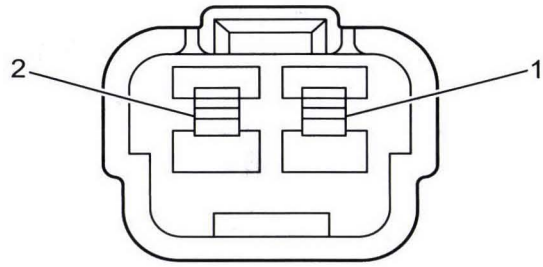
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-34 (YE)	No Tool Required	Not Required	Not Required	Not Required	Not Required

E6 Center High Mounted Stop Lamp

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	VT/WH	5065	Stop Lamp Relay Coil Control	I	TT9
2	0.35 0.5	BK BK	1250 1250	Ground	I	TT9+UVC TT9-UVC

E7L License Plate Lamp - Left



3995062

Connector Part Information

Harness Type: Liftgate
OEM Connector: MG620074
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way M 2.3 Series (NA)

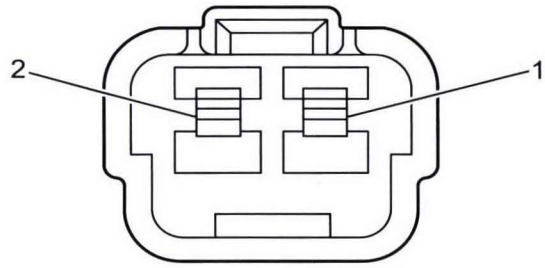
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-19 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required

E7L License Plate Lamp - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK	1150	Ground	I	-(EF7/Z49)
2	0.5	GN/YE	6846	Rear License Lamp Control	I	-(EF7/Z49)

E7R License Plate Lamp - Right



3995062

Connector Part Information

Harness Type: Liftgate
OEM Connector: MG620074
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way M 2.3 Series (NA)

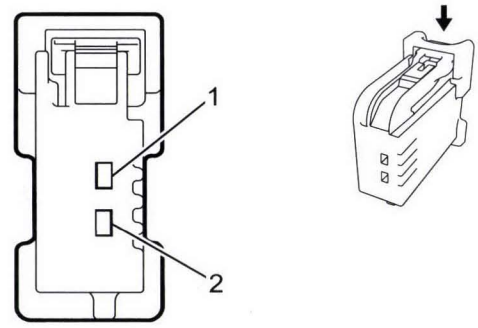
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-19 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required

E7R License Plate Lamp - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK	1150	Ground	I	EF7/Z49
2	0.5	GN/YE	6846	Rear License Lamp Control	I	EF7/Z49

E8S Rear Compartment Courtesy Lamp



2173586

Connector Part Information

Harness Type: Body
OEM Connector: 6098-5510
Service Connector: 13584097
Description: 2-Way F 1.5 Series (BK)

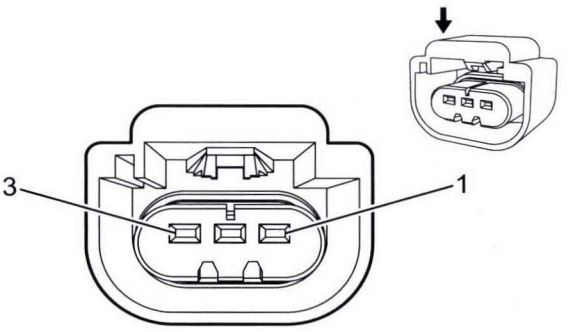
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-2A (GY)	Not Required	Not Required	Not Required	Not Required	Not Required

E8S Rear Compartment Courtesy Lamp

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GN/GY	737	Rear Compartment Lid Lamp Control	I	—
2	0.5	BK	1150	Ground	I	—

E13L Headlamp - Left (EF7/Z49)



2173560

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 13511136
Service Connector: 13584279
Description: 3-Way F 150 GT Series, Sealed (GN)

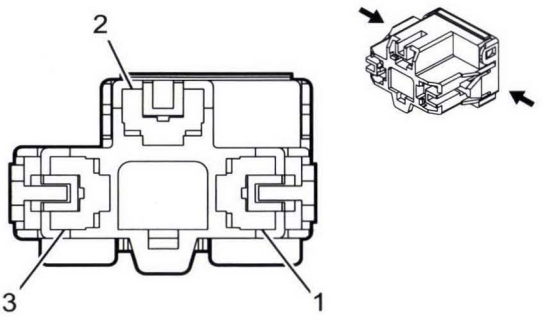
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

E13L Headlamp - Left (EF7/Z49)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1	BN	12	Headlamp Low Beam Control	I	EF7/Z49
2	1	BK	50	Ground	I	EF7/Z49
3	0.75	GN	11	Headlamp High Beam Control	I	EF7/Z49

E13L Headlamp - Left (-EF7-Z49)



4025807

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 172615-2
Service Connector: 19331440
Description: 3-Way F 8.0 Pos Lock (BK)

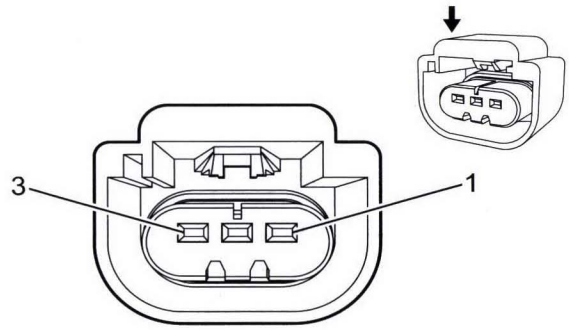
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

E13L Headlamp - Left (-EF7-Z49)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1	BK	50	Ground	I	-EF7-Z49
2	1	BN	12	Headlamp Low Beam Control	I	-EF7-Z49
3	0.75	GN	11	Headlamp High Beam Control	II	-EF7-Z49

E13R Headlamp - Right (EF7/Z49)



2173560

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 13511136
Service Connector: 13584279
Description: 3-Way F 150 GT Series, Sealed (GN)

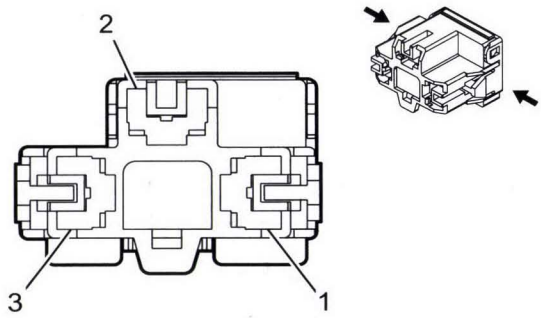
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

E13R Headlamp - Right (EF7/Z49)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1	YE	312	Right Headlamp Low Beam Control	I	EF7/Z49
2	1	BK	150	Ground	I	EF7/Z49
3	0.75	WH	311	Right Headlamp High Beam Control	I	EF7/Z49

E13R Headlamp - Right (-EF7-Z49)



4025807

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 172615-2
Service Connector: 19331440
Description: 3-Way F 8.0 Pos Lock (BK)

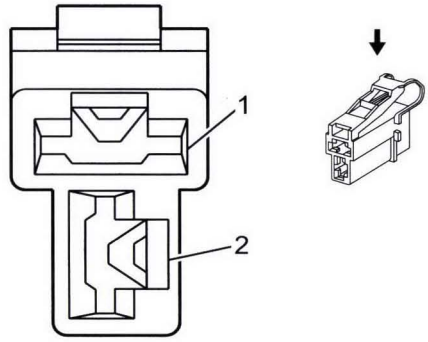
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

E13R Headlamp - Right (-EF7-Z49)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1	BK	150	Ground	I	-EF7-Z49
2	1	YE	312	Right Headlamp Low Beam Control	I	-EF7-Z49
3	0.75	WH	311	Right Headlamp High Beam Control	II	-EF7-Z49

E14B Seat Heating Element - Driver Cushion



1977741

Connector Part Information

Harness Type: Body
OEM Connector: MG610263
Service Connector: 13577007
Description: 2-Way F 250 Series (NA)

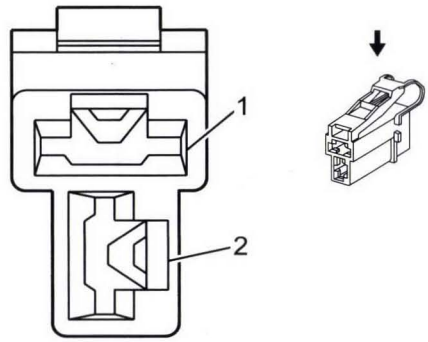
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

E14B Seat Heating Element - Driver Cushion

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BN/GY	1462	Heated Seat Switch Signal	I	C38
2	0.5	BK	750	Ground	I	C37

E14D Seat Heating Element - Passenger Cushion



1977741

Connector Part Information

Harness Type: Body
OEM Connector: MG610263
Service Connector: 13577007
Description: 2-Way F 250 Series (NA)

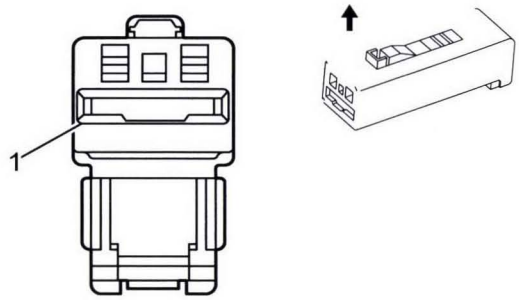
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

E14D Seat Heating Element - Passenger Cushion

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	YE/BK	1505	Passenger Heated Seat Switch Signal	I	C38
2	0.5	BK	750	Ground	I	C38

E18 Rear Defogger Grid X1



2178166

Connector Part Information

Harness Type: Liftgate
OEM Connector: 174090-2
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 1-Way F 250 Series (BK)

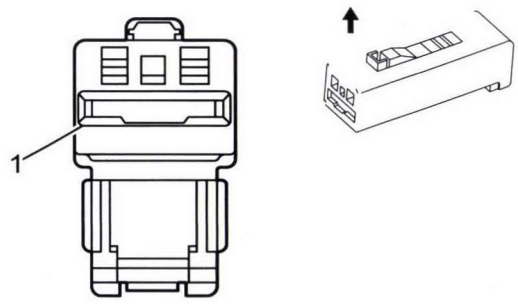
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-42 (RD)	No Tool Required	Not Required	Not Required	Not Required	Not Required

E18 Rear Defogger Grid X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	2	BN/VT	293	Rear Defog Element Control	I	—

E18 Rear Defogger Grid X2



2178166

Connector Part Information

Harness Type: Liftgate Extension
OEM Connector: 174090-2
Service Connector: 13395393
Description: 1-Way F 250 Series (BK)

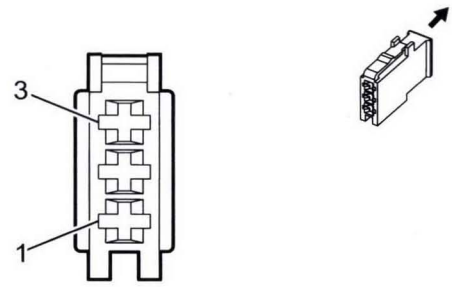
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Avail-able	J-35616-42 (RD)	J-38125-12A	927852-8	24	2	A

E18 Rear Defogger Grid X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1.5	BK	1250	Ground	I	STD

E37A Dome/Reading Lamps (UE1)



2817422

Connector Part Information

Harness Type: Body
OEM Connector: 1-962343-1
Service Connector: 19301381
Description: 3-Way F (BK)

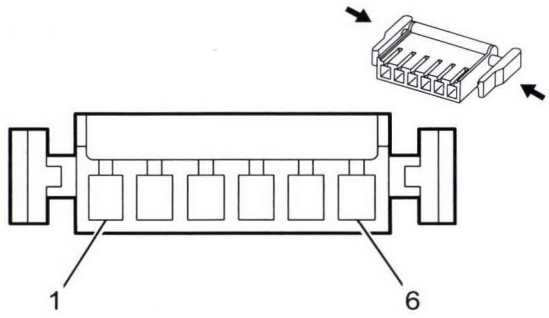
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

E37A Dome/Reading Lamps (UE1)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	WH/BN	6815	Inadvertent Power Control	II	UE1
2	0.75	GY	157	Interior Lamp Control	II	UE1
3	0.5	BK	650	Ground	I	UE1

E37A Dome/Reading Lamps (-UE1)



2173602

Connector Part Information

Harness Type: Body
OEM Connector: 13726957
Service Connector: 13576539
Description: 6-Way F 0.64 Micro-Quadlock Series (BK)

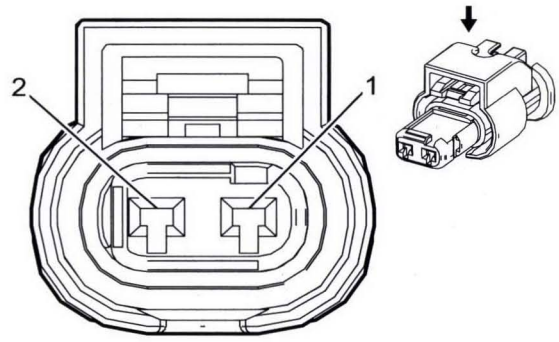
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

E37A Dome/Reading Lamps (-UE1)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	-
2	0.5	BK	650	Ground	I	-UE1
3	0.75	GY	157	Interior Lamp Control	I	-UE1
4	0.75	WH/BN	6815	Inadvertent Power Control	I	-UE1
5 - 6	—	—	—	Not Occupied	—	—

F106RR Seat Air Bag Right - Rear



2474752

Connector Part Information

Harness Type: Body
OEM Connector: 1-1823608-4
Service Connector: 13587886
Description: 2-Way F 1.2 Multiple Contact Point Series, Sealed (YE with BK Inner Connector)

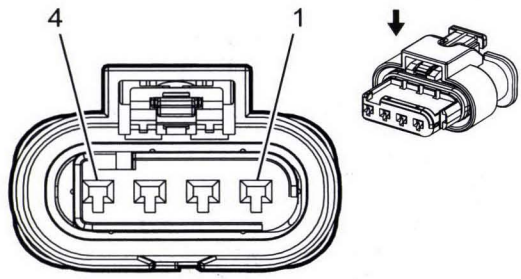
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

F106RR Seat Air Bag Right - Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	VT/OG	5225	Right Rear Side Impact SIR Inflator Control	I	AYF/AW7
2	0.5	OG/GY	5226	Right Rear Side Impact SIR Inflator Control	I	AYF/AW7

F101 Passenger Instrument Panel Air Bag X1



2684560

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 1-2141402-4
Service Connector: 13586137
Description: 4-Way F 1.2 Series, Sealed (YE)

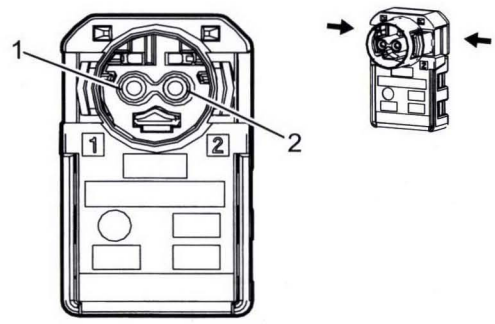
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

F101 Passenger Instrument Panel Air Bag X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	YE/OG	3025	Passenger IP Module Stage 1 High Control	I	AYF/AW7
2	0.5	OG/WH	3024	Passenger IP Module Stage 1 Low Control	I	AYF/AW7
3	0.5	GY/OG	3027	Passenger IP Module Stage 2 High Control	I	AYF/AW7
4	0.5	OG/VT	3026	Passenger IP Module Stage 2 Low Control	I	AYF/AW7

F101 Passenger Instrument Panel Air Bag X2



2484234

Connector Part Information

Harness Type: Passenger Instrument Panel Air Bag
OEM Connector: 13262035
Service Connector: 19118659
Description: 2-Way F (L-BU With YE Case)

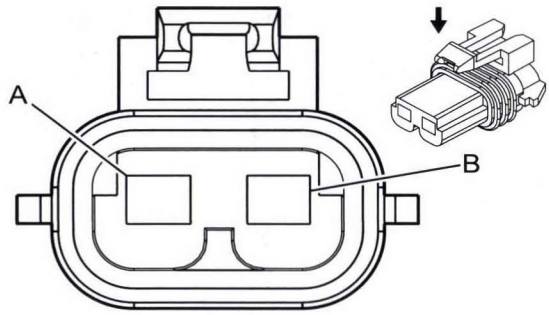
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Connector Assembly - 19118659	J-35616-64B (L-BU)	Not Available	Service by Harness - See Part Catalog	Not Avail-able	Not Avail-able	Not Avail-able

F101 Passenger Instrument Panel Air Bag X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	YE	3025	Passenger Instrument Panel Module Stage 1 High Control	I	-
2	0.5	OG	3024	Passenger Instrument Panel Module Stage 1 Low Control	I	-

F103 Power Inverter Module Assembly Cable Cover



684799

Connector Part Information

Harness Type: Engine
OEM Connector: 12077900
Service Connector: 12116247
Description: 2-Way F 280 Metri-Pack Series, Sealed (BK)

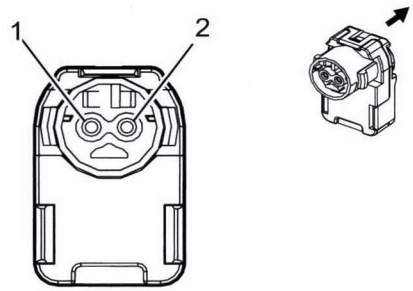
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-4A (PU)	Not Required	Not Required	Not Required	Not Required	Not Required

F103 Power Inverter Module Assembly Cable Cover

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	BK/BN	5088	High Voltage Interlock Loop Low Reference (1)	I	—
B	0.5	BK/BN	5088	High Voltage Interlock Loop Low Reference (1)	I	—

F105L Roof Rail Air Bag - Left



2893366

Connector Part Information

Harness Type: Body
OEM Connector: 2005339-1
Service Connector: 19180245
Description: 2-Way F 0.64 Series, Sealed (BK with YE cover)

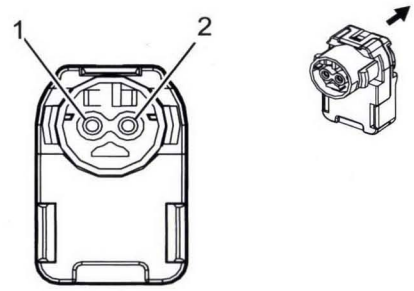
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

F105L Roof Rail Air Bag - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/GN	5019	Left Front Head Curtain Module High Control	I	AYF/AW7
2	0.5	VT/OG	5020	Left Front Head Curtain Module Low Control	I	AYF/AW7

F105R Roof Rail Air Bag - Right



2893366

Connector Part Information

Harness Type: Body
OEM Connector: 2005339-1
Service Connector: 19180245
Description: 2-Way F 0.64 Series, Sealed (BK with YE cover)

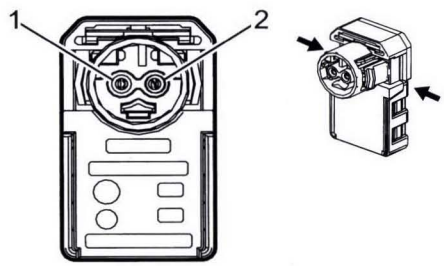
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

F105R Roof Rail Air Bag - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/GY	5021	Right Front Head Curtain Module High Control	I	AYF/AW7
2	0.5	WH/OG	5022	Right Front Head Curtain Module Low Control	I	AYF/AW7

F106D Seat Side Air Bag - Driver



2231587

Connector Part Information

Harness Type: Body
OEM Connector: 988537901
Service Connector: Service by Harness - See Part Catalog
Description: 2-Way F (BK with YE cover)

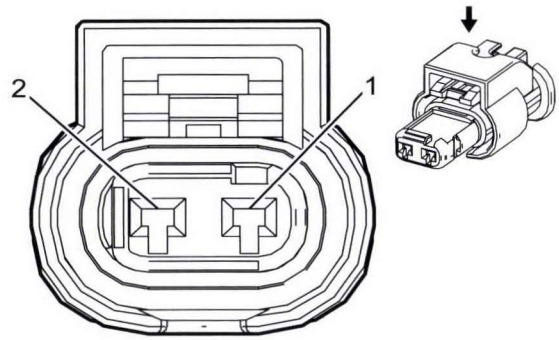
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

F106D Seat Side Air Bag - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	PU/WH	5019	Left Front Head Curtain Module High Control	I	—
2	0.5	PK	5020	Left Front Head Curtain Module Low Control	I	—

F106LF Side Air Bag - Left Front



2474752

Connector Part Information

Harness Type: Body
OEM Connector: 1-1823608-4
Service Connector: 13587886
Description: 2-Way F 1.2 Multiple Contact Point Series, Sealed (YE with BK Inner Connector)

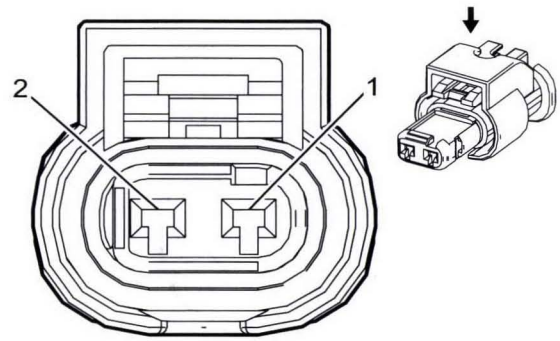
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

F106LF Side Air Bag - Left Front

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/BU	3068	Driver Side Impact Module High Control	I	AYF/AW7
2	0.5	GN/OG	3069	Driver Side Impact Module Low Control	I	AYF/AW7

F106LR Seat Air Bag - Left Rear



2474752

Connector Part Information

Harness Type: Body
OEM Connector: 1-1823608-4
Service Connector: 13587886
Description: 2-Way F 1.2 Multiple Contact Point Series, Sealed (YE with BK Inner Connector)

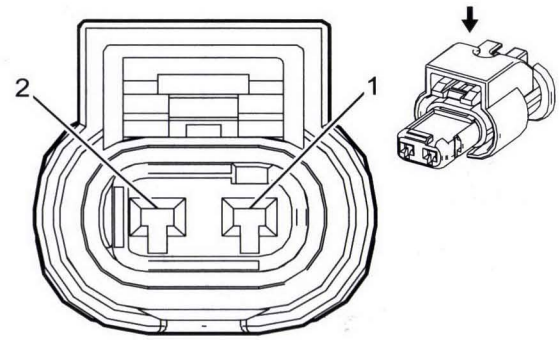
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

F106LR Seat Air Bag - Left Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/GY	5223	Left Rear Side Impact SIR Inflator Control	I	AYF/AW7
2	0.5	BN/OG	5224	Left Rear Side Impact SIR Inflator Control	I	AYF/AW7

F106RF Seat Air Bag - Right Front



2474752

Connector Part Information

Harness Type: Body
OEM Connector: 1-1823608-4
Service Connector: 13587886
Description: 2-Way F 1.2 Multiple Contact Point Series, Sealed (YE with BK Inner Connector)

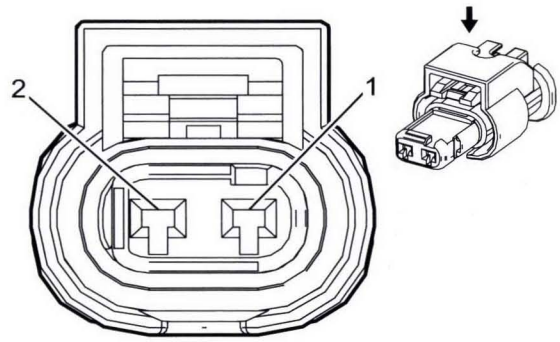
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

F106RF Seat Air Bag - Right Front

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/GY	3066	Passenger Side Impact Module High Control	I	AYF/AW7
2	0.5	BN/OG	3067	Passenger Side Impact Module Low Control	I	AYF/AW7

F106RR Seat Air Bag Right - Rear



2474752

Connector Part Information

Harness Type: Body
OEM Connector: 1-1823608-4
Service Connector: 13587886
Description: 2-Way F 1.2 Multiple Contact Point Series, Sealed (YE with BK Inner Connector)

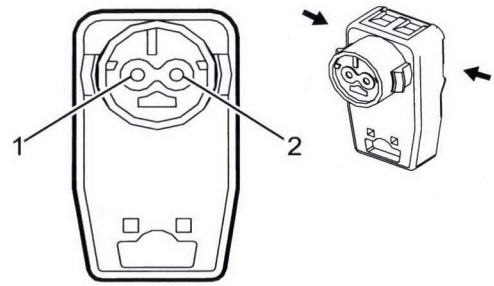
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

F106RR Seat Air Bag Right - Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	VT/OG	5225	Right Rear Side Impact SIR Inflator Control	I	AYF/AW7
2	0.5	OG/GY	5226	Right Rear Side Impact SIR Inflator Control	I	AYF/AW7

F107 Steering Wheel Air Bag X1



2589957

Connector Part Information

Harness Type: Steering Wheel Air Bag Coil
OEM Connector: 19153417
Service Connector: Service by Component Assembly - See Part Catalog
Description: 2-Way F (L-GN Body with YE Cover)

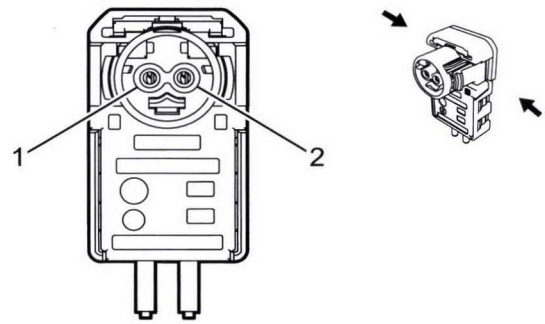
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

F107 Steering Wheel Air Bag X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	TN	3021	Steering Wheel Module Stage 1 High Control	I	—
2	0.5	BN	3020	Steering Wheel Module Stage 1 Low Control	I	—

F107 Steering Wheel Air Bag X2



2239322

Connector Part Information

Harness Type: Steering Wheel Air Bag Coil
OEM Connector: Not Available
Service Connector: Service by Component Assembly - See Part Catalog
Description: 2-Way F (YE Body with YE Cover)

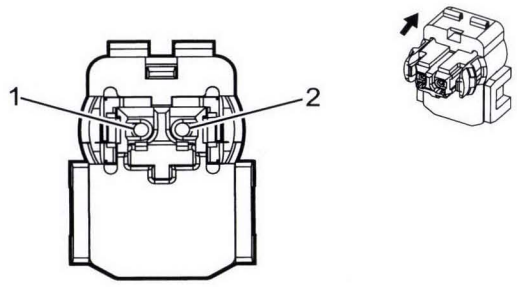
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

F107 Steering Wheel Air Bag X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	RD	3023	Steering Wheel Module Stage 2 High Control	I	—
2	0.5	BN	3022	Steering Wheel Module Stage 2 Low Control	I	—

F112D Seat Belt Retractor Pretensioner - Driver



2817421

Connector Part Information

Harness Type: Body
OEM Connector: SQHR-02H-1A-K
Service Connector: 13577005
Description: 2-Way F SQH Series (BK)

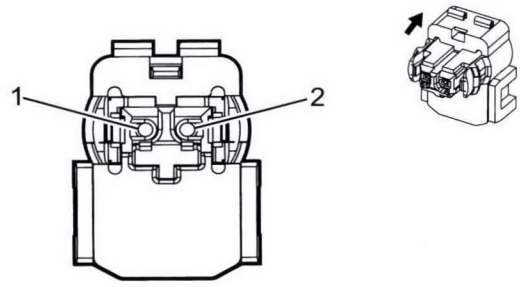
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

F112D Seat Belt Retractor Pretensioner - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/WH	3477	Driver Seat Belt Retractor Pretensioner High Control	I	AWT
2	0.5	GY/OG	3478	Driver Seat Belt Retractor Pretensioner Low Control	I	AWT

F112P Seat Belt Retractor Pretensioner - Passenger



2817421

Connector Part Information

Harness Type: Body
OEM Connector: SQHR-02H-1A-K
Service Connector: 13577005
Description: 2-Way F SQH Series (BK)

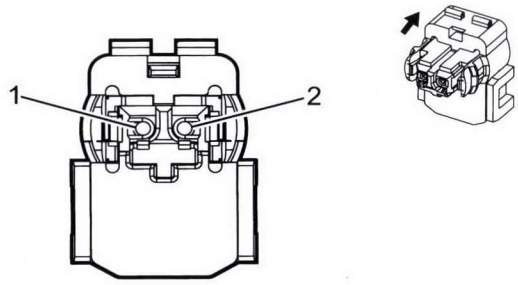
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

F112P Seat Belt Retractor Pretensioner - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/GN	3475	Passenger Seat Belt Retractor Pretensioner High Control	I	AWS
2	0.5	WH/OG	3476	Passenger Seat Belt Retractor Pretensioner Low Control	I	AWS

F113D Seat Belt Anchor Pretensioner - Driver



2817421

Connector Part Information

Harness Type: Body
OEM Connector: SQHR-02H-1A-K
Service Connector: 13577005
Description: 2-Way F SQH Series (BK)

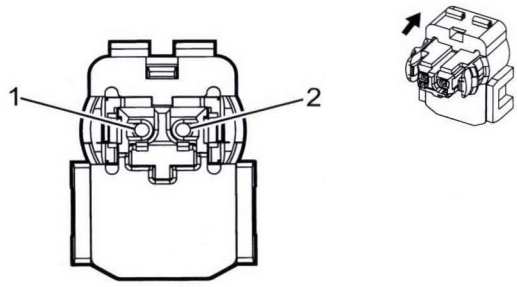
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

F113D Seat Belt Anchor Pretensioner - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/YE	3481	Driver Seat Belt Anchor Pretensioner High Control	I	AYF/AW7
2	0.5	YE/OG	3482	Driver Seat Belt Anchor Pretensioner Low Control	I	AYF/AW7

F113P Seat Belt Anchor Pretensioner - Passenger



2817421

Connector Part Information

Harness Type: Body
OEM Connector: SQHR-02H-1A-K
Service Connector: 13577005
Description: 2-Way F SQH Series (BK)

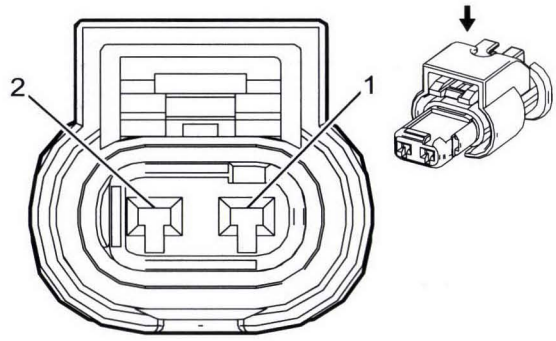
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

F113P Seat Belt Anchor Pretensioner - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/BN	3479	Passenger Seat Belt Anchor Pretensioner High Control	I	AYF/AW7
2	0.5	GY/OG	3480	Passenger Seat Belt Anchor Pretensioner Low Control	I	AYF/AW7

F114D Knee Air Bag - Driver



2474752

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 1-1823608-4
Service Connector: 13587886
Description: 2-Way F 1.2 Multiple Contact Point Series, Sealed (YE with BK Inner Connector)

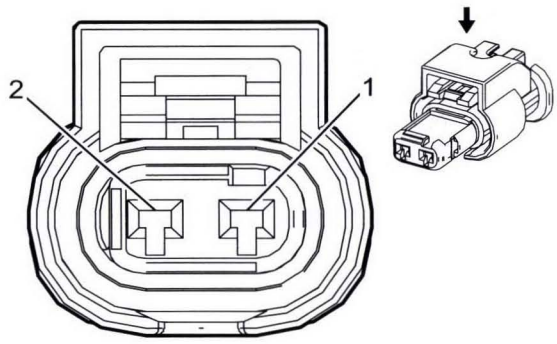
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

F114D Knee Air Bag - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/BU	3078	Driver Knee Module High Control	I	AYF
2	0.5	GY/OG	3079	Driver Knee Module Low Control	I	AYF

F114P Knee Air Bag - Passenger



2474752

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 1-1823608-4
Service Connector: 13587886
Description: 2-Way F 1.2 Multiple Contact Point Series, Sealed (YE with BK Inner Connector)

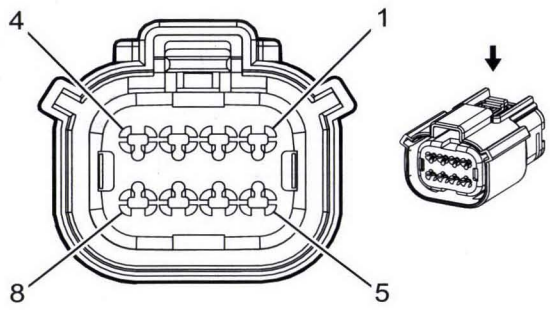
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

F114P Knee Air Bag - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	4	BK	1050	Ground	II	—
	0.5	OG/BU	3076	Passenger Knee Module High Control	I	AYF
2	0.5	WH/OG	3077	Passenger Knee Module Low Control	I	AYF

G1 A/C Compressor X1



2268728

Connector Part Information

Harness Type: Engine
OEM Connector: 33472-0806
Service Connector: 13577527
Description: 8-Way F 150 MX Series, Sealed (BK)

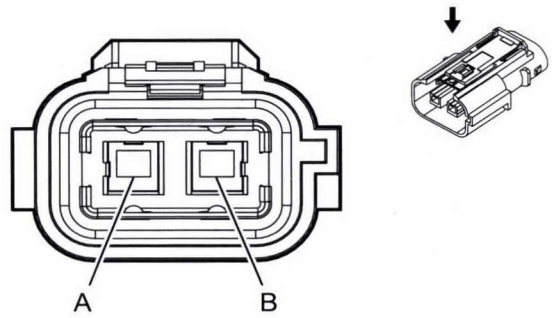
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-2A (GY)	Not Required	Not Required	Not Required	Not Required	Not Required

G1 A/C Compressor X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK	2050	Ground	I	—
2	0.5	BU/WH	3977	Accessory Wakeup Serial Data 2	I	—
3	0.5	VT/GN	39	Run/Crank Ignition 1 Voltage	I	—
4	0.5	RD/WH	2740	Battery Positive Voltage	I	—
5	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
6	0.5 0.5	WH WH	2501 2501	High Speed GMLAN Serial Data (-) (1)	I	CBT -CBT
7	0.5 0.5	BU BU	2500 2500	High Speed GMLAN Serial Data (+) (1)	I	CBT -CBT
8	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—

G1 A/C Compressor X2



2891114

Connector Part Information

Harness Type: High Voltage
OEM Connector: 13861584
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 280 Metri-Pack Series, Sealed

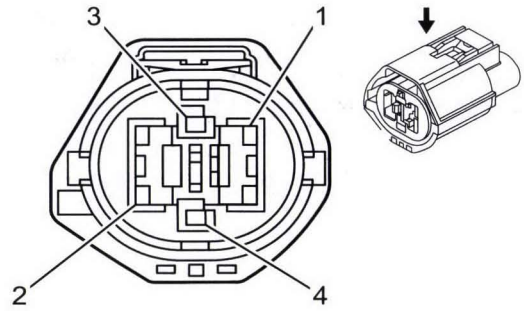
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

G1 A/C Compressor X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	5	OG	3974	High Voltage Battery 5 (+)	I	—
B	5	OG	3973	High Voltage Battery 5 (-)	I	—

G10 Cooling Fan Motor



1745131

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 7283-8496-30
Service Connector: 19115593
Description: 4-Way F Mixed Series, Sealed (BK)

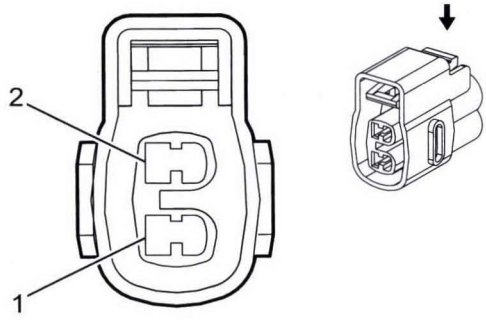
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-22 (RD)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-2A (GY)	Not Required	Not Required	Not Required	Not Required	Not Required

G10 Cooling Fan Motor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	4	GY	532	Cooling Fan Motor Control (2)	I	—
2	4	BK	50	Ground	I	—
3	—	—	—	Not Occupied	—	—
4	0.5	WH	2368	Cooling Fan Control Signal	II	—

G19 Rear Window Washer Pump



2268770

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: MG640605
Service Connector: 13577039
Description: 2-Way M 090 Series, Sealed (NA)

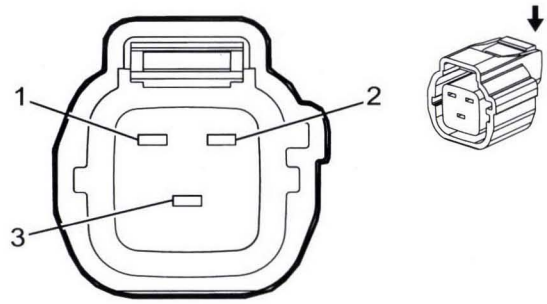
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-18 (BK)	Not Required	Not Required	Not Required	Not Required	Not Required

G19 Rear Window Washer Pump

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	BU/VT	392	Rear Window Washer Pump Control	I	CD6
2	0.75	BK	150	Ground	I	CD6

G24 Windshield Washer Pump



2268774

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: MG641362
Service Connector: 13577040
Description: 3-Way F 090 Series, Sealed (NA)

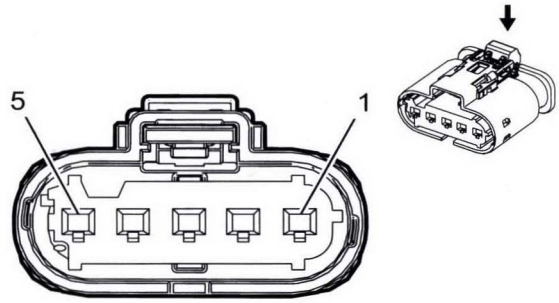
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

G24 Windshield Washer Pump

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	GY/VT	228	Windshield Washer Pump Control	I	—
2	0.75	BK	150	Ground	I	—
3	—	—	—	Not Occupied	—	—

G35 Hybrid/EV Electronics Coolant Pump



2474671

Connector Part Information

Harness Type: Engine
OEM Connector: 9408621
Service Connector: 19300589
Description: 5-Way F 1.2 MLK Series, Sealed (BK)

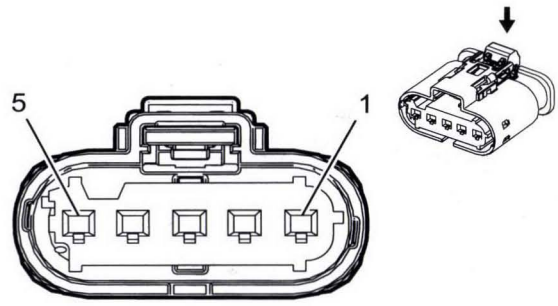
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

G35 Hybrid/EV Electronics Coolant Pump

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BN/BU	3788	Electric Coolant Motor Control	I	—
2	0.5	VT/BU	3790	Electric Coolant Motor Feedback Signal	I	—
3	0.5	YE/GN	3789	Electric Coolant Motor Control	I	—
4	0.5	BK	250	Ground	I	—
5	0.5	VT/BN	300	Run Ignition 3 Voltage	I	—

G36 Auxiliary Heater Coolant Pump



2474671

Connector Part Information

Harness Type: Engine
OEM Connector: 9408621
Service Connector: 19300589
Description: 5-Way F 1.2 MLK Series, Sealed (BK)

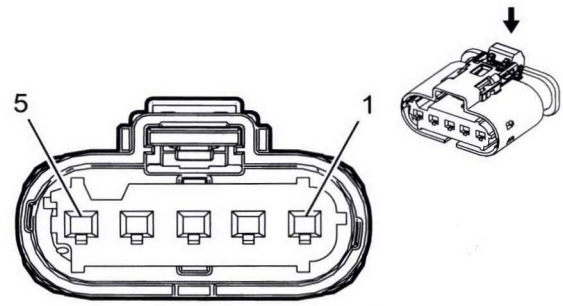
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

G36 Auxiliary Heater Coolant Pump

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GN/GY	3853	Cabin Heater Coolant Motor Control	I	—
2	0.5	BN/BU	3852	Cabin Heater Coolant Motor Feedback Signal	I	—
3	0.5	VT/YE	3854	Cabin Heater Coolant Motor Control	I	—
4	0.5	BK	250	Ground	I	—
5	0.5	RD/WH	3440	Battery Positive Voltage	I	—

G37 Hybrid/EV Battery Pack Coolant Pump



2474671

Connector Part Information

Harness Type: Engine
OEM Connector: 9408621
Service Connector: 19300589
Description: 5-Way F 1.2 MLK Series, Sealed (BK)

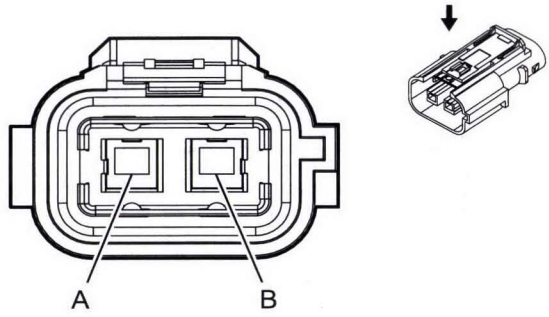
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

G37 Hybrid/EV Battery Pack Coolant Pump

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	WH/GN	3794	Rechargeable Energy Storage System 1 Coolant Motor Control	I	—
2	0.5	YE/GY	3796	Rechargeable Energy Storage System 1 Coolant Motor Feedback Signal	I	—
3	0.5	BU/VT	3795	Rechargeable Energy Storage System 1 Coolant Motor Control	I	—
4	0.5	BK	250	Ground	I	—
5	0.5	RD/VT	3340	Battery Positive Voltage	I	—

K1 14V Power Module X1



2891114

Connector Part Information

Harness Type: High Voltage
OEM Connector: 13861584
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 280 Metri-Pack Series, Sealed

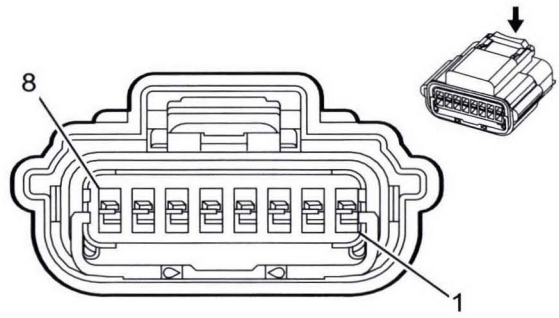
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

K1 14V Power Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	3	OG	5084	High Voltage Battery (+)	I	—
B	3	OG	5083	High Voltage Battery (-)	I	—

K1 14V Power Module X2



2581486

Connector Part Information

Harness Type: Engine
OEM Connector: ATSSPB-C08C-1AK
Service Connector: 13583440
Description: 8-Way F 0.64 Series, Sealed (BK)

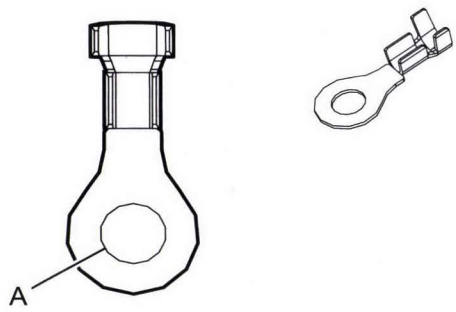
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

K1 14V Power Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	YE/VT	1262	Accessory Power Module Bit 0 Signal	I	—
2	0.5	OG/BK	249	Accessory Power Module Ignition	I	—
3	0.5	BN/GN	3793	Accessory Power Module Cooling Fan Feedback Signal	I	—
4	0.5	VT	249	Accessory Power Module Ignition	I	—
5	0.5	BN	249	Accessory Power Module Ignition	I	—
6	0.5	YE/BK	249	Accessory Power Module Ignition	I	—
7	0.5	WH/YE	249	Accessory Power Module Ignition	I	—
8	0.5	BU	249	Accessory Power Module Ignition	I	—

K1 14V Power Module X3



2268796

Connector Part Information

Harness Type: Battery Cable
OEM Connector: 95176337
Service Connector: Service by Harness - See Part Catalog
Description: 1-Way (NA)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	Not Required	No Tool Required	Not Required	Not Required	Not Required	Not Required

K1 14V Power Module X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	1	RD	1	Unfused Battery Positive Voltage	I	—

K1 14V Power Module X4

—

Connector Part Information

Harness Type: Negative Battery Cable
OEM Connector: AKX46076
Service Connector: Service by Component – See Part Catalog
Description: 1-Way Ring Terminal (NA)

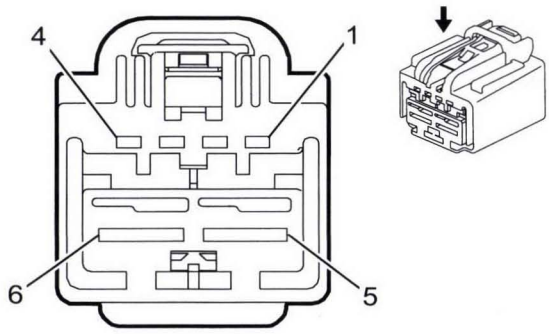
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Component – See Part Catalog	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

K1 14V Power Module X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	20	BK	50	Ground	I	—

K8 Blower Motor Control Module X1



1798802

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 7283-9749-30
Service Connector: 88988512
Description: 6-Way F YESC Kaizen Series (BK)

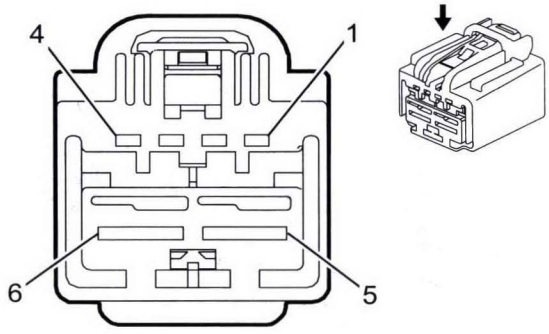
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-64B (L-BU)	Not Available	Not Available	Not Available	Not Available	Not Available

K8 Blower Motor Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1-2	-	-	-	Not Occupied	-	-
3	0.5	BU/GY	754	Blower Motor Speed Control	I	—
4	-	-	-	Not Occupied	-	-
5	2.5	BK	1050	Ground	I	—
6	2.5	VT/BN	41	Run Ignition 3 Voltage	I	—

K8 Blower Motor Control Module X2



1798802

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 7283-9749-30
Service Connector: 88988512
Description: 6-Way F YESC Kaizen Series (BK)

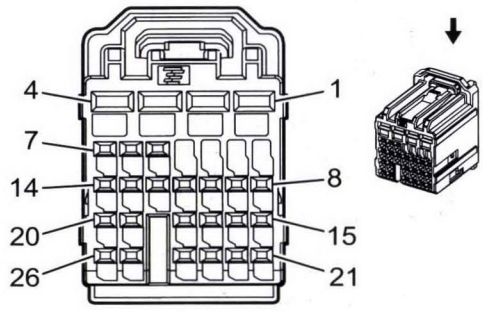
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-42 (RD)	Not Required	Not Required	Not Required	Not Required	Not Required

K8 Blower Motor Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	-
3	0.5	BU/GY	754	Blower Motor Speed Control	I	—
4	—	—	—	Not Occupied	—	-
5	2	BK	1050	Ground	II	—
6	2	RD/WH	140	Battery Positive Voltage	II	—

K9 Body Control Module X1



2537268

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 2098067-1
Service Connector: 13576031
Description: 26-Way F 0.64, 2.8 Series (NA)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13582297	J-35616-64B (LT BU)	J-38125-22	Not Available	Not Available	Not Available	Not Available
II	13582326	J-35616-35 (VT)	J-38125-553	8100-4444	11	2	A
III	13575578	J-35616-35 (VT)	J-38125-553	8100-4445	12	F	D

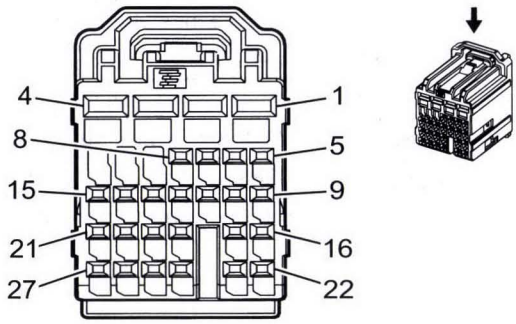
K9 Body Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	2.5	BK	850	Ground	III	—
2	2.5	RD/YE	2340	Battery Positive Voltage	III	—
3	2.5	RD/BN	2240	Battery Positive Voltage	III	—
4	1	RD/GY	2140	Battery Positive Voltage	II	—
5	—	—	—	Not Occupied	—	-
6	0.35	GN/WH	2270	Rear Window Washer Relay Control	I	CD6
7	0.35	BK/YE	5005	Instrument Panel Lamp Dimmer Switch Low Reference	I	—
8 - 10	—	—	—	Not Occupied	—	-
11	0.35	GN/BN	306	Headlamp Switch Headlamps Off Signal Control	I	T83
12	—	—	—	Not Occupied	—	-
13	0.35	BU/RD	1688	5 Volt Reference	I	—
14 - 15	—	—	—	Not Occupied	—	-
16	0.35	WH/VT	103	Headlamp Switch On Signal	I	—
17	0.35	GY/YE	7543	Hazard LED Dimming Signal	I	—
18	0.35	BU/VT	1788	Traction Control Switch Signal (1)	I	—
19	0.35	BK/BN	5360	Brake Apply Sensor Low Reference	I	—
20	0.35	BU/BK	5719	Ignition Mode Switch Start LED Signal	I	BTM

K9 Body Control Module X1 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
21	0.35	WH/BN	3955	Charging Complete Indicator Control	I	—
22	0.35	GN/GY	13	Headlamp Switch Park Lamp Signal	I	—
23	0.35	YE/GY	230	Instrument Panel Lamp Dimming Control	I	BTM
24	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
25	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
26	0.35	YE/GN	3274	Remote Function Actuator Transmit Signal	I	—

K9 Body Control Module X2



2537269

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 2098067-2
Service Connector: 13576032
Description: 27-Way F 0.64, 2.8 Series (BU)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13582297	J-35616-64B (LT BU)	J-38125-22	Not Available	Not Available	Not Available	Not Available
II	13582326	J-35616-35 (VT)	J-38125-553	8100-4444	11	2	A
III	13575578	J-35616-35 (VT)	J-38125-553	8100-4445	12	F	D
IV	13575578	J-35616-35 (VT)	J-38125-553	Not Available	Not Available	Not Available	Not Available

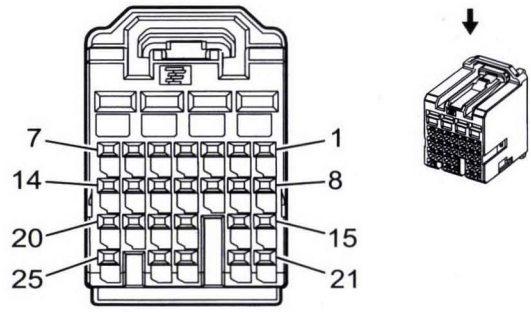
K9 Body Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1	RD/BN	1140	Battery Positive Voltage	II	—
2	2.5	BK	850	Ground	III	—
3	1.5	RD/GN	1540	Battery Positive Voltage	IV	—
4	2.5	RD	1840	Battery Positive Voltage	III	—
5 - 6	—	—	—	Not Occupied	—	-
7	0.35	BU/YE	5361	Brake Apply Sensor Signal	I	—
8	0.5	YE	6817	LED Backlight Dimming Control	I	—
9	0.35	YE/GY	44	Instrument Panel Lamp Dimmer Switch Signal	I	—
10	0.35	WH/BU	278	Ambient Light Sensor Signal	I	T83
11	—	—	—	Not Occupied	—	-
12	0.35	BN/BU	391	Rear Window Wiper Switch Signal	I	—
13	0.35	WH	5359	Brake Apply Sensor Control	I	—
14	0.35	GY	5054	Sport Mode Switch Signal	I	—
15	—	—	—	Not Occupied	—	-
16	0.35	GY	3273	Remote Function Actuator Low Reference	I	—
17	0.35	BU/GN	5723	Ignition Mode Switch Mode Voltage	I	BTM

K9 Body Control Module X2 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
18	—	—	—	Not Occupied	—	-
19	0.35	BU/GY	187	Rear Fog Lamp Switch Signal	I	-T83
20 - 21	—	—	—	Not Occupied	—	-
22	0.5	GN	5060	Low Speed GMLAN Serial Data	I	—
23	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
24	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
25	0.35	GY/WH	3272	Remote Function Actuator Control	I	—
26	0.35	GN/WH	111	Hazard Switch Signal	I	—
27	0.35	BU/WH	3275	Remote Function Actuator Receive Signal	I	—

K9 Body Control Module X3



2537274

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 2098067-7
Service Connector: 13576037
Description: 25-Way F 0.64, 2.8 Series (GN)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13582297	J-35616-64B (LT BU)	J-38125-22	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

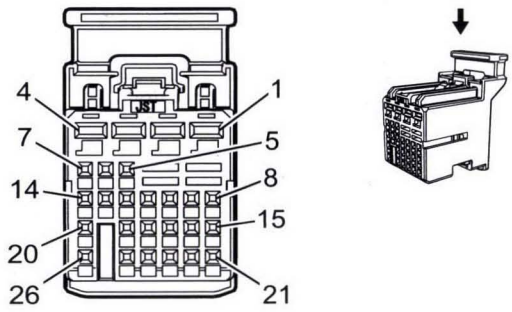
K9 Body Control Module X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GN/GY	3277	Vehicle Anti-Theft System Immobilizer Low Reference	I	—
2	0.35	GN/VT	7533	Local Interconnect Network Serial Data Bus 11	I	—
3	0.35	GY/BK	3276	Vehicle Anti-Theft System Immobilizer Control	I	—
4	0.35 0.35	WH/RD WH/RD	1444 1444	12 Volt Reference	I	UC3+K34 UC3+-K34
5	0.35 0.35	VT/YE VT/YE	4 4	Accessory Ignition Voltage	I	BTM -BTM
6	0.35 0.35	VT/BK VT/BK	3 3	Run/Crank Ignition 1 Voltage	I	BTM -BTM
7	0.35	WH/VT	5905	Key Capture/Column Lock Shift Position Signal	I	-BTM
8	0.35 0.35 0.35	GN/WH GN/WH GN/WH	6819 6819 6819	Steering Wheel Resistor Ladder Signal 2	I	K34+UC3-(EF7/ Z49) UC3+-K34 UC3+K34+(EF7/ Z49)
9	0.35 0.35	BN/GN BN/GN	1884 1884	Cruise Control Set/Coast/Resume/Accelerate Switch Signal	I	K34+UC3-(EF7/ Z49) UC3+K34+(EF7/ Z49)
10	0.35	BK/GY	6009	Windshield Wiper Switch Low Reference	I	—
11	0.35	VT/YE	525	Headlamp Dimmer Switch Low Beam Signal	I	—
12	0.35	WH/GN	663	Hazard Switch Left Turn Signal	I	—

K9 Body Control Module X3 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
13	0.35	YE/BU	1714	Windshield Wiper Switch Low Signal	I	—
14	—	—	—	Not Occupied	—	-
15	0.35	WH/VT	1020	Off/Run/Crank Ignition Voltage	I	-BTM
16	—	—	—	Not Occupied	—	-
17	0.35	YE/BN	307	Headlamp Switch Flash To Pass Signal	I	—
18	0.35 0.35 0.35	GN/WH GN/WH GN/WH	3287 3287 3287	Horn Switch Signal	I	K34+UC3-(EF7/ Z49) UC3+-K34 UC3+K34+(EF7/ Z49)
19	—	—	—	Not Occupied	—	-
20	0.35	GY	1715	Windshield Wiper Switch High Signal	I	—
21	—	—	—	Not Occupied	—	-
22	0.35	WH/BK	1073	Ignition Key Resistor Signal	I	-BTM
23	—	—	—	Not Occupied	—	-
24	0.35	VT/BU	664	Hazard Switch Right Turn Signal	I	—
25	0.35	WH/BK	94	Windshield Washer Switch Signal	I	—

K9 Body Control Module X4



2282913

Connector Part Information

Harness Type: Body
OEM Connector: HIT2PB-26-D-K
Service Connector: 19151263
Description: 26-Way F 0.64 2.8 Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13582297	J-35616-64B (LT BU)	J-38125-22	Not Available	Not Avail-able	Not Avail-able	Not Avail-able
II	13582326	J-35616-35 (VT)	J-38125-553	8100-4444	11	2	A

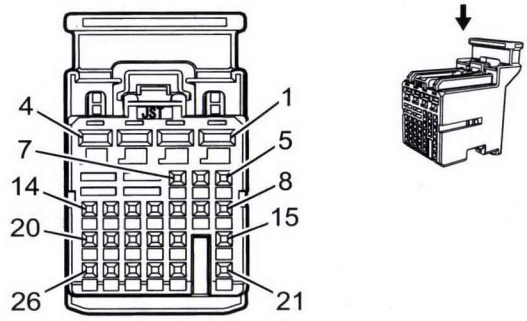
K9 Body Control Module X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1	YE	312	Right Headlamp Low Beam Control	II	—
2	1	YE	712	Left Headlamp Low Beam Control	II	—
3	0.75 0.75	GN/VT GN/VT	1315 1315	Right Front Turn Signal Lamp Control	II	D71 DLS
4	0.75 0.75	BU/VT BU/VT	1335 1335	Right Rear Turn Signal Lamp Control	II	-(EF7+Z49) EF7/Z49
5	0.5	GY/BN	309	Right Park Lamp Control	I	—
6	0.5	VT/GY	709	Left Park Lamp Control	I	—
7	0.5 0.5	GY/YE GY/YE	7542 7542	Left Rear Stop Lamp Control	I	-(EF7+Z49) EF7/Z49
8 - 9	—	—	—	Not Occupied	—	-
10	0.35	YE	5420	Rear Wiper Motor Relay Coil Control	I	CD6
11	0.5	VT/WH	5065	Stop Lamp Relay Coil Control	I	—
12	0.35	GY/VT	755	RAP Relay Coil Control	I	—
13	0.5	GN/YE	6846	Rear License Lamp Control	I	—
14	0.35	BN/GY	2268	Windshield Washer Relay Control	I	—
15	0.35	GN/VT	5199	Run/Crank Relay Coil Control	I	—
16	0.35	GY	91	Windshield Wiper Motor Relay Coil Control	I	—
17	0.5	BN/GN	196	Windshield Wiper Motor Park Switch Signal	I	—

K9 Body Control Module X4 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
18	0.35	WH/YE	5075	Current Sensor Signal	I	—
19	0.35	WH/VT	5905	Key Capture/Column Lock Shift Position Signal	I	BTM
20	0.35	RD/BN	440	Battery Positive Voltage	I	—
21	0.35	BU/VT	5076	Current Sensor Control	I	—
22	0.35	VT/YE	5985	Accessory Wakeup Serial Data	I	—
23	0.5	WH/BU	5986	Serial Data Communication Enable	I	—
24	0.35	BN/GN	109	Hood Ajar Switch Signal	I	—
25	—	—	—	Not Occupied	—	-
26	0.5	BK	450	Ground	I	—

K9 Body Control Module X5



2282914

Connector Part Information

Harness Type: Body
OEM Connector: HIT2PB-26-E-N
Service Connector: 19151264
Description: 26-Way F 0.64 2.8 Series (BN)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13582297	J-35616-64B (LT BU)	J-38125-22	Not Available	Not Avail-able	Not Avail-able	Not Avail-able
II	13582326	J-35616-35 (VT)	J-38125-553	8100-4444	11	2	A

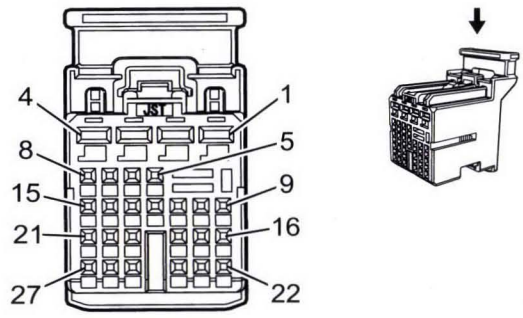
K9 Body Control Module X5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75 0.75	BU/WH BU/WH	1334 1334	Left Rear Turn Signal Lamp Control	II	-(EF7+Z49) EF7/Z49
2	0.75 0.75	BU/WH BU/WH	1314 1314	Left Front Turn Signal Lamp Control	II	D71 DLS
3	1	RD/VT	2640	Battery Positive Voltage	II	—
4	1	RD/BU	2540	Battery Positive Voltage	II	—
5	0.5	BN/BU	1977	Rear Fog Lamp Relay Control	I	T79
6	0.35	BK/VT	5077	Current Sensor Low Reference	I	—
7	0.5 0.5	WH/YE WH/YE	7541 7541	Right Rear Stop Lamp Control	I	-(EF7+Z49) EF7/Z49
8 - 10	—	—	—	Not Occupied	—	-
11	0.35	VT/BU	3263	Logistic Mode Relay Open Control	I	-CW1
12	0.35	WH/BU	6311	Cruise/ETC/TCC Brake Signal	I	—
13	—	—	—	Not Occupied	—	-
14	0.35	BN/VT	5486	Run Relay Coil Control	I	—
15 - 17	—	—	—	Not Occupied	—	-
18	0.35	BN/VT	1969	Headlamp High Beam Relay Control	I	—
19	0.35	BN/WH	28	Horn Relay Control	I	—
20 - 23	—	—	—	Not Occupied	—	-

K9 Body Control Module X5 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
24	0.35	WH/VT	860	Front Windshield Wiper Switch High Signal	I	—
25 - 26	—	—	—	Not Occupied	—	—

K9 Body Control Module X6



2282918

Connector Part Information

Harness Type: Body
OEM Connector: HIT2PB-27-F-PK
Service Connector: 19151267
Description: 27-Way F 0.64 2.8 Series (PK)

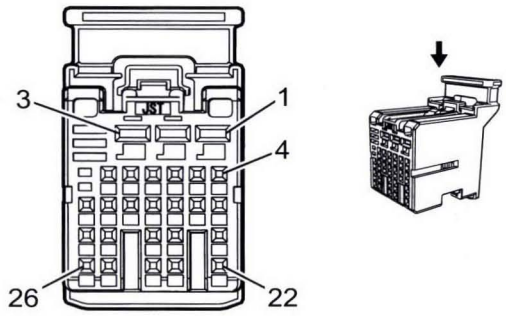
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13582297	J-35616-64B (LT BU)	J-38125-22	Not Available	Not Available	Not Available	Not Available
II	13582326	J-35616-35 (VT)	J-38125-553	8100-4444	11	2	A
III	13575578	J-35616-35 (VT)	J-38125-553	8100-4445	12	F	D

K9 Body Control Module X6

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	GY	5911	Door Lock Actuator Lock Control 2	II	—
2	0.75	GY	295	Door Lock Actuator Lock Control	II	—
3	2.5	BK	450	Ground	III	—
4	0.75	BN/YE	294	Door Lock Actuator Unlock Control	II	—
5	0.35	VT/GY	1303	Lift Gate Ajar Switch Signal (1)	I	—
6 - 12	—	—	—	Not Occupied	—	-
13	0.35	GY	746	Right Front Door Ajar Switch Signal	I	—
14	—	—	—	Not Occupied	—	-
15	0.35 0.35	BN/YE BN/YE	780 780	Driver Door Lock Switch Lock Signal	I	EF7/Z49 -EF7/-Z49
16 - 21	—	—	—	Not Occupied	—	-
22	0.35	GY	745	Left Front Door Ajar Switch Signal	I	—
23	—	—	—	Not Occupied	—	-
24	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
25	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
26	—	—	—	Not Occupied	—	-
27	0.35	GY	747	Left Rear Door Ajar Switch Signal	I	—

K9 Body Control Module X7



2282920

Connector Part Information

Harness Type: Body
OEM Connector: HIT2PB-26-G-H
Service Connector: 19151265
Description: 26-Way F 0.64 2.8 Series (GY)

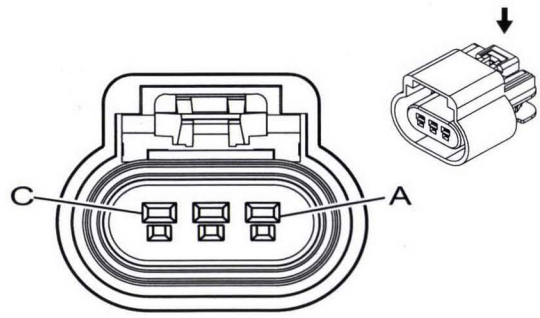
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13582297	J-35616-64B (LT BU)	J-38125-22	Not Available	Not Available	Not Available	Not Available
II	13582326	J-35616-35 (VT)	J-38125-553	8100-4444	11	2	A

K9 Body Control Module X7

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75 0.75	GY GY	157 157	Interior Lamp Control	II	UE1 -UE1
2	0.75 0.75	WH/BN WH/BN	6815 6815	Inadvertent Power Control	II	UE1 -UE1
3	0.75	GN/WH	24	Backup Lamp Control	II	—
4 - 5	—	—	—	Not Occupied	—	-
6	0.5	VT/BK	7553	Park Lock Solenoid Control	I	—
7	0.5	GN/GY	737	Rear Compartment Lid Lamp Control	I	—
8 - 10	—	—	—	Not Occupied	—	-
11	0.35	GY	748	Right Rear Door Ajar Switch Signal	I	—
12	—	—	—	Not Occupied	—	-
13	0.35	BU/VT	1124	Door Lock Key Switch Unlock Signal	I	AU3
14	0.35 0.35	BN/WH BN/WH	781 781	Driver Door Lock Switch Unlock Signal	I	EF7/Z49 -EF7/-Z49
15	—	—	—	Not Occupied	—	-
16	0.35	GY/VT	3264	Logistic Mode Relay Close Control	I	-CW1
17 - 18	—	—	—	Not Occupied	—	-
19	0.35	YE/BN	1123	Door Lock Key Switch Lock Signal	I	AU3
20 - 26	—	—	—	Not Occupied	—	—

K10 Coolant Heater Control Module X1



646415

Connector Part Information

Harness Type: Engine
OEM Connector: 15326808
Service Connector: 13580871
Description: 3-Way F 150 GT Series, Sealed (BK)

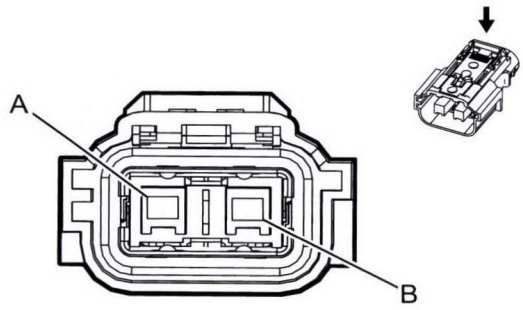
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

K10 Coolant Heater Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	BK	2050	Ground	I	—
B	0.5	GN	5060	Low Speed GMLAN Serial Data	I	—
C	0.5	RD/GY	2140	Battery Positive Voltage	I	—

K10 Coolant Heater Control Module X2



3818811

Connector Part Information

Harness Type: Battery Cable
OEM Connector: 13830159
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 280 Metri-Pack Series, Sealed (OG)

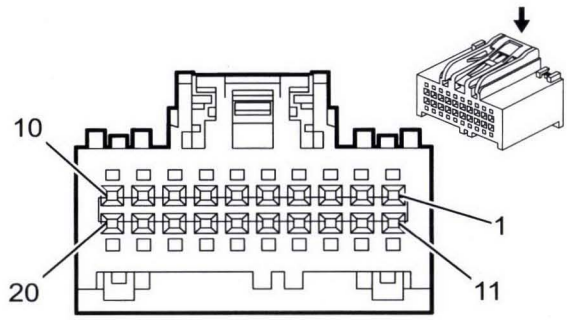
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-35 (VT)	No Tool Required	Not Required	Not Required	Not Required	Not Required

K10 Coolant Heater Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	5	OG	3970	High Voltage Battery 4 (+)	I	—
B	5	OG	3969	High Voltage Battery 4 (-)	I	—

K16 Battery Energy Control Module X3



1715223

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 15489824
Service Connector: 15126711
Description: 20-Way F 0.64 Series (BK with WH Terminal Position Assurance)

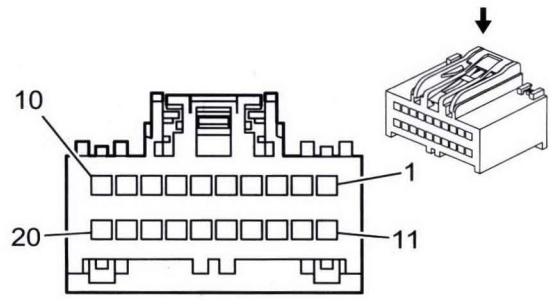
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327119	J-35616-64B (L-BU)	J-38125-215A	SAIT-A03T-M064	14	P	P

K16 Battery Energy Control Module X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	BK/VT	5403	Battery Pack Monitor Low Reference	I	-
2	0.35	YE/VT	5394	Battery Voltage Signal (2)	I	-
3	0.35	GY/YE	5396	Battery Voltage Signal (4)	I	-
4	0.35	L-GN	5398	Battery Voltage Signal (6)	I	-
5	0.35	D-BU	5400	Battery Voltage Signal (8)	I	-
6	0.35	D-BU/GY	5392	Battery Voltage Signal (10)	I	-
7	0.35	BN	5571	Battery Voltage Signal (12)	I	-
8	0.35	YE	5573	Battery Voltage Signal (14)	I	-
9	0.35	BN/WH	5575	Battery Voltage Signal (16)	I	-
10	-	-	-	Not Occupied	-	-
11	0.35	VT	5391	Battery Voltage Signal (1)	I	-
12	0.35	WH	5395	Battery Voltage Signal (3)	I	-
13	0.35	YE/L-GN	5397	Battery Voltage Signal (5)	I	-
14	0.35	YE/BN	5399	Battery Voltage Signal (7)	I	-
15	0.35	L-GN/BK	5401	Battery Voltage Signal (9)	I	-
16	0.35	L-GN/GY	5393	Battery Voltage Signal (11)	I	-
17	0.35	YE/GY	5572	Battery Voltage Signal (13)	I	-
18	0.35	WH/BK	5574	Battery Voltage Signal (15)	I	-
19-20	-	-	-	Not Occupied	-	-

K16 Battery Energy Control Module X6



1715228

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 15491304
Service Connector: 15126710
Description: 20-Way F USCAR 64 Series (GY)

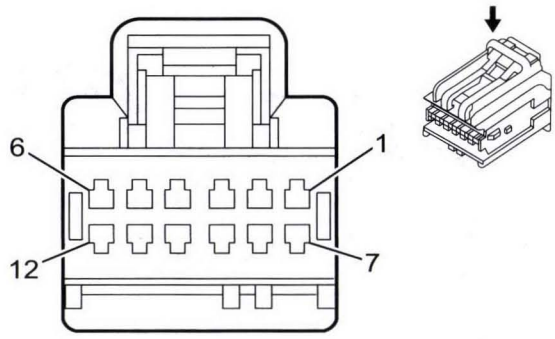
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327119	J-35616-64B (L-BU)	J-38125-215A	SAIT-A03T-M064	14	P	P

K16 Battery Energy Control Module X6

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	BN/WH	5575	Battery Voltage Signal (16)	I	-
2	0.35	WH/D-BU	5576	Battery Voltage Signal (17)	I	-
3	0.35	L-GN/WH	5578	Battery Voltage Signal (19)	I	-
4	0.35	L-GN/BN	5580	Battery Voltage Signal (21)	I	-
5	0.35	GY/BK	5582	Battery Voltage Signal (23)	I	-
6	0.35	VT/WH	5584	Battery Voltage Signal (25)	I	-
7	0.35	GY/L-GN	5585	Battery Voltage Signal (26)	I	-
8	0.35	GY/BK	5587	Battery Voltage Signal (28)	I	-
9	0.35	VT/L-GN	5589	Battery Voltage Signal (30)	I	-
10	0.35	GY	5591	Battery Voltage Signal (32)	I	-
11	0.35	WH/D-BU	5576	Battery Voltage Signal (17)	I	-
12	0.35	L-GN/VT	5577	Battery Voltage Signal (18)	I	-
13	0.35	YE/BK	5579	Battery Voltage Signal (20)	I	-
14	0.35	D-BU/WH	5581	Battery Voltage Signal (22)	I	-
15	0.35	WH/BK	5583	Battery Voltage Signal (24)	I	-
16	0.35	VT/WH	5584	Battery Voltage Signal (25)	I	-
17	0.35	D-BU/BK	5586	Battery Voltage Signal (27)	I	-
18	0.35	YE/WH	5588	Battery Voltage Signal (29)	I	-
19	0.35	L-GN/BK	5590	Battery Voltage Signal (31)	I	-
20	-	-	-	Not Occupied	-	-

K16 Battery Energy Control Module X7



1664569

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 13551678
Service Connector: 89047364
Description: 12-Way F 0.64 Series (BK)

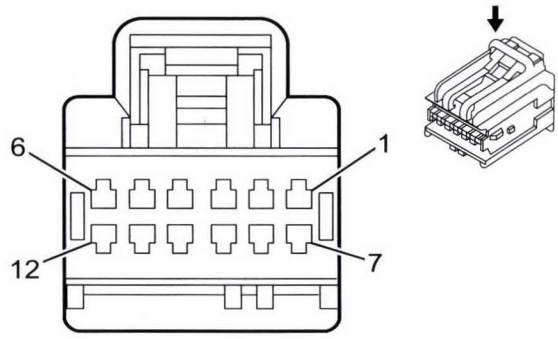
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13579944	J-35616-64B (L-BU)	J-38125-215A	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

K16 Battery Energy Control Module X7

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GY	5591	Battery Voltage Signal (32)	I	-
2	0.35	GY/WH	5592	Battery Voltage Signal (33)	I	-
3	0.35	BK/VT	4516	Battery Cell Voltage Signal (35)	I	-
4	0.35	YE/VT	4518	Battery Cell Voltage Signal (37)	I	-
5	0.35	GY/YE	4520	Battery Cell Voltage Signal (39)	I	-
6	-	-	-	Not Occupied	-	-
7	0.35	GY/WH	5592	Battery Voltage Signal (33)	I	-
8	0.35	VT/BK	4514	Battery Cell Voltage Signal (34)	I	-
9	0.35	VT	4517	Battery Cell Voltage Signal (36)	I	-
10	0.35	WH	4519	Battery Cell Voltage Signal (38)	I	-
11	0.35	YE/L-GN	4521	Battery Cell Voltage Signal (40)	I	-
12	-	-	-	Not Occupied	-	-

K16 Battery Energy Control Module X8



1664569

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 13551678
Service Connector: 89047364
Description: 12-Way F 0.64 Series (BK)

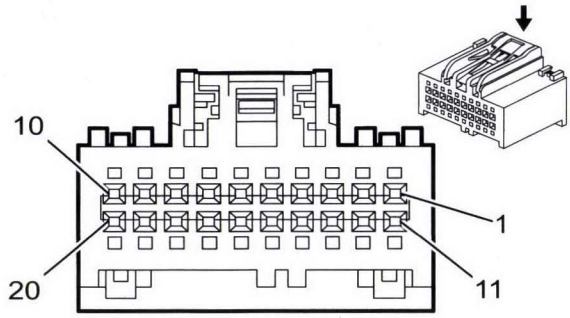
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13579944	J-35616-64B (L-BU)	J-38125-215A	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

K16 Battery Energy Control Module X8

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	YE/L-GN	4521	Battery Cell Voltage Signal (40)	I	-
2	0.35	L-GN	4522	Battery Cell Voltage Signal (41)	I	-
3	0.35	D-BU	4524	Battery Cell Voltage Signal (43)	I	-
4	0.35	D-BU/GY	4526	Battery Cell Voltage Signal (45)	I	-
5	0.35	BN	4528	Battery Cell Voltage Signal (47)	I	-
6	-	-	-	Not Occupied	-	-
7	0.35	L-GN	4522	Battery Cell Voltage Signal (41)	I	-
8	0.35	YE/BN	4523	Battery Cell Voltage Signal (42)	I	-
9	0.35	L-GN/BK	4525	Battery Cell Voltage Signal (44)	I	-
10	0.35	L-GN/GY	4527	Battery Cell Voltage Signal (46)	I	-
11	0.35	YE/GY	4529	Battery Cell Voltage Signal (48)	I	-
12	-	-	-	Not Occupied	-	-

K16 Battery Energy Control Module X9



1715223

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 15489824
Service Connector: 15126711
Description: 20-Way F 0.64 Series (BK with WH Terminal Position Assurance)

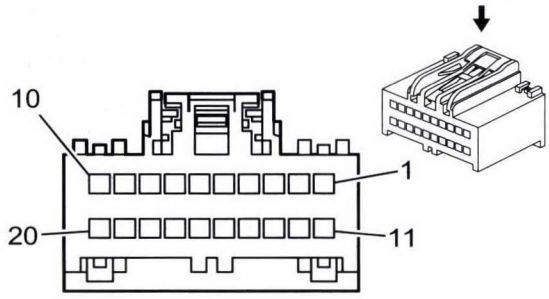
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327119	J-35616-64B (L-BU)	J-38125-215A	SAIT-A03T-M064	14	P	P

K16 Battery Energy Control Module X9

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	YE/GY	4529	Battery Cell Voltage Signal (48)	I	-
2	0.35	YE	4530	Battery Cell Voltage Signal (49)	I	-
3	0.35	BN/WH	4532	Battery Cell Voltage Signal (51)	I	-
4	0.35	WH/D-BU	4535	Battery Cell Voltage Signal (53)	I	-
5	0.35	L-GN/WH	4537	Battery Cell Voltage Signal (55)	I	-
6	0.35	GY/BN	4541	Battery Cell Voltage Signal (57)	I	-
7	0.35	D-BU/WH	4543	Battery Cell Voltage Signal (58)	I	-
8	0.35	WH/BK	4545	Battery Cell Voltage Signal (60)	I	-
9	0.35	GY/L-GN	4547	Battery Cell Voltage Signal (62)	I	-
10	0.35	GY/BK	4549	Battery Cell Voltage Signal (64)	I	-
11	0.35	YE	4530	Battery Cell Voltage Signal (49)	I	-
12	0.35	WH/BK	4531	Battery Cell Voltage Signal (50)	I	-
13	0.35	D-BU/YE	4533	Battery Cell Voltage Signal (52)	I	-
14	0.35	L-GN/VT	4536	Battery Cell Voltage Signal (54)	I	-
15	0.35	YE/BK	4538	Battery Cell Voltage Signal (56)	I	-
16	0.35	GY/BN	4541	Battery Cell Voltage Signal (57)	I	-
17	0.35	GY/BK	4544	Battery Cell Voltage Signal (59)	I	-
18	0.35	VT/WH	4546	Battery Cell Voltage Signal (61)	I	-
19	0.35	D-BU/BK	4548	Battery Cell Voltage Signal (63)	I	-
20	-	-	-	Not Occupied	-	-

K16 Battery Energy Control Module X10



1715228

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 15491304
Service Connector: 15126710
Description: 20-Way F USCAR 64 Series (GY)

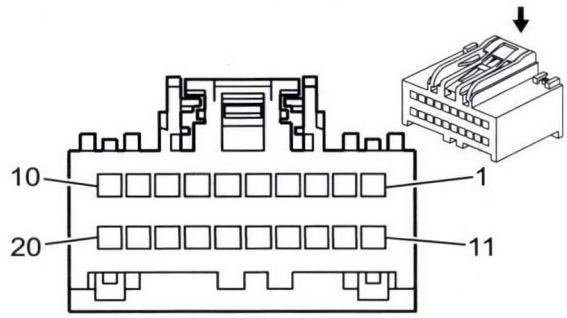
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327119	J-35616-64B (L-BU)	J-38125-215A	SAIT-A03T-M064	14	P	P

K16 Battery Energy Control Module X10

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GY/BK	4549	Battery Cell Voltage Signal (64)	I	-
2	0.35	YE/WH	4553	Battery Cell Voltage Signal (65)	I	-
3	0.35	L-GN/BK	4555	Battery Cell Voltage Signal (67)	I	-
4	0.35	GY/WH	4557	Battery Cell Voltage Signal (69)	I	-
5	0.35	BK/VT	4560	Battery Cell Voltage Signal (71)	I	-
6	0.35	YE/VT	4562	Battery Cell Voltage Signal (73)	I	-
7	0.35	WH	4563	Battery Cell Voltage Signal (74)	I	-
8	0.35	YE/L-GN	4565	Battery Cell Voltage Signal (76)	I	-
9	0.35	YE/BN	4567	Battery Cell Voltage Signal (78)	I	-
10	0.35	L-GN/BK	4569	Battery Cell Voltage Signal (80)	I	-
11	0.35	YE/WH	4553	Battery Cell Voltage Signal (65)	I	-
12	0.35	VT/L-GN	4554	Battery Cell Voltage Signal (66)	I	-
13	0.35	GY	4556	Battery Cell Voltage Signal (68)	I	-
14	0.35	VT/BK	4558	Battery Cell Voltage Signal (70)	I	-
15	0.35	VT	4561	Battery Cell Voltage Signal (72)	I	-
16	0.35	YE/VT	4562	Battery Cell Voltage Signal (73)	I	-
17	0.35	GY/YE	4564	Battery Cell Voltage Signal (75)	I	-
18	0.35	L-GN	4566	Battery Cell Voltage Signal (77)	I	-
19	0.35	D-BU	4568	Battery Cell Voltage Signal (79)	I	-
20	0.35	GY/YE	2396	Battery Cell Voltage Signal (96)	I	-

K16 Battery Energy Control Module X11



1715226

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 15491305
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 20-Way F USCAR 64 Series (BN)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

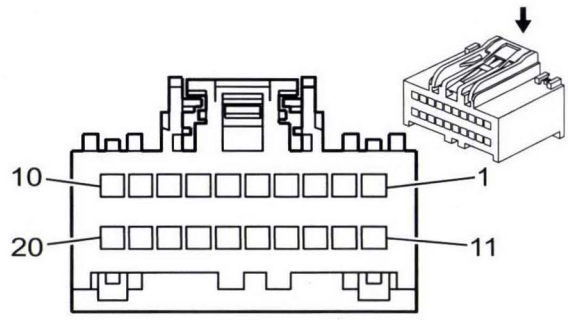
K16 Battery Energy Control Module X11

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK/D-BU	5404	Charge Port Paddle Temperature Sensor Low Reference	I	—
2	0.5	BN/WH	5406	Battery Module Temperature Signal (2)	I	—
3	0.5	L-GN/GY	5407	Battery Module Temperature Signal (3)	I	—
4	0.5	WH/BK	5408	Battery Module Temperature Signal (4)	I	—
5	0.5	L-GN/BK	5409	Battery Module Temperature Signal (5)	I	—
6	0.5	GY/BN	5410	Battery Module Temperature Signal (6)	I	—
7	0.5	YE	5411	Battery Module Temperature Signal (7)	I	—
8	0.5	VT	5412	Battery Module Temperature Signal (8)	I	—
9	0.35	VT/RD	2965	High Voltage Battery Current Sensor Voltage Reference	I	—
10	0.35	D-BU/YE	2962	High Voltage Battery Current Sensor Course Signal	I	—
11	0.5	D-BU	3373	Auxiliary Video High Signal (2)	I	—
12	0.5	BK/D-BU	3774	Battery Module Temperature Sensor Low Reference (2)	I	—
13	0.5	BK/L-GN	3775	Battery Module Temperature Sensor Low Reference (3)	I	—
14	0.5	BK/YE	3778	Battery Module Temperature Sensor Low Reference (6)	I	—
15	0.5	BK/VT	3777	Battery Module Temperature Sensor Low Reference (5)	I	—

K16 Battery Energy Control Module X11 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
16	0.5	BK/YE	3778	Battery Module Temperature Sensor Low Reference (6)	I	—
17	0.5	BK/D-BU	3779	Battery Module Temperature Sensor Low Reference (7)	I	—
18	0.5	BK/L-GN	3780	Battery Module Temperature Sensor Low Reference (8)	I	—
19	0.35	BK/GY	2963	High Voltage Battery Current Sensor Low Reference	I	—
20	0.5	L-GN/BN	2961	High Voltage Battery Current Sensor Fine Signal	I	—

K16 Battery Energy Control Module X12



1715226

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 15491305
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 20-Way F USCAR 64 Series (BN)

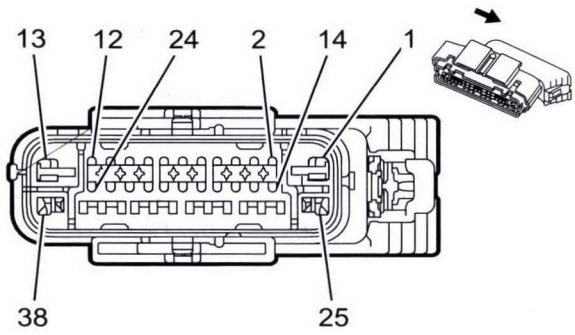
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

K16 Battery Energy Control Module X12

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	RD/VT	1640	Battery Positive Voltage	I	—
2	0.35	GY/RD	705	5 Volt Reference	I	—
3	0.35	D-BU/WH	3977	Accessory Wakeup Serial Data 2	I	—
4	0.5	WH	6435	CAN Bus Low 2 Serial Data	I	—
5	0.5	D-BU/GY	6434	CAN Bus High 2 Serial Data	I	—
6	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
7	0.5	D-BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
8	0.35	BK	2050	Ground	I	—
9	0.35	D-BU/GY	5139	High Voltage Fault Signal	I	—
10	0.35	BK	150	Ground	I	—
11	—	—	—	Not Occupied	—	-
12	0.35	VT/GY	139	Run/Crank Ignition 1 Voltage	I	—
13	0.35	D-BU/BN	3787	High Voltage Energy Management Communication Control	I	—
14 - 15	—	—	—	Not Occupied	—	-
16	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
17	0.5	D-BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
18	0.35	WH	6435	CAN Bus Low 2 Serial Data	I	—
19	0.35	D-BU/GY	6434	CAN Bus High 2 Serial Data	I	—
20	—	—	—	Not Occupied	—	—

K17 Electronic Brake Control Module



1986146

Connector Part Information

Harness Type: Engine
OEM Connector: 31380-1000
Service Connector: 19178085
Description: 38-Way F 0.64, 2.8, 6.3 Series, Sealed (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13576407	J-35616-4A (PU)	J-38125-553	15304720	15	4	5
II	13575773	J-35616-2A (GY)	J-38125-560	Not Available	Not Avail-able	Not Avail-able	Not Avail-able
III	13578924	J-35616-64B (LT BU)	J-38125-215A	SAITS-A03T-M064	24	9	9
IV	13579767	J-35616-42 (RD)	J-38125-11A	7116-4142-02	8	A	3

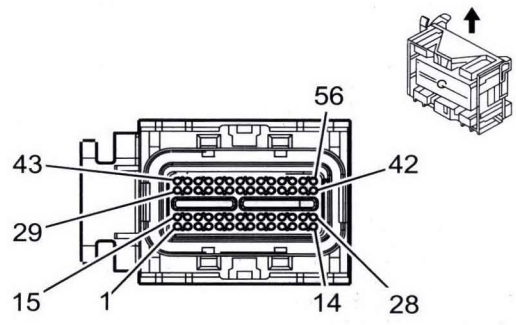
K17 Electronic Brake Control Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	4	RD/WH	140	Battery Positive Voltage	IV	—
2	0.5	BK/VT	883	Wheel Speed Sensor Low Reference Right Rear	III	—
3	0.5	VT	882	Wheel Speed Sensor Signal Right Rear	III	—
4	0.5	BU	884	Wheel Speed Sensor Signal Left Rear	III	—
5	0.5	BK/BU	885	Wheel Speed Sensor Low Reference Left Rear	III	—
6	0.5	BK/YE	833	Wheel Speed Sensor Low Reference Right Front	III	—
7 - 8	—	—	—	Not Occupied	—	-
9	0.5	BU/YE	3334	Brake Pedal Travel Sensor 1 Signal	III	—
10	—	—	—	Not Occupied	—	-
11	0.5	GN/GY	333	Brake Fluid Level Sensor Signal	III	—
12	0.5	BU/WH	3977	Accessory Wakeup Serial Data 2	III	—
13	4	BK	250	Ground	IV	—
14	0.5	RD/BN	1742	Battery Positive Voltage	III	—
15	0.5	BK/GY	3417	Brake Pedal Travel Sensor 1 Low Reference	III	—
16	—	—	—	Not Occupied	—	-

K17 Electronic Brake Control Module (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
17	0.5	YE	872	Wheel Speed Sensor Signal Right Front	III	—
18	—	—	—	Not Occupied	—	-
19	0.5	BU/RD	3335	Brake Pedal Travel Sensor 1 High Reference	III	—
20	—	—	—	Not Occupied	—	-
21	0.5	WH	6106	High Speed GMLAN Serial Data (-) (2)	III	—
22	0.5	WH	6106	High Speed GMLAN Serial Data (-) (2)	III	—
23	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	III	—
24	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	III	—
25	2.5	RD/GN	40	Battery Positive Voltage	I	—
26 - 27	—	—	—	Not Occupied	—	-
28	0.5	GY	830	Wheel Speed Sensor Signal Left Front	III	—
29	0.5	BK/GY	873	Left Front Wheel Speed Sensor Low Reference	III	—
30	0.5	VT/BN	300	Run Ignition 3 Voltage	II	—
31	0.5	RD/WH	2740	Battery Positive Voltage	II	—
32	0.5	VT/GN	39	Run/Crank Ignition 1 Voltage	II	—
33	0.5	BU/YE	6105	High Speed GMLAN Serial Data (+) (2)	III	—
34	0.5	BU/YE	6105	High Speed GMLAN Serial Data (+) (2)	III	—
35	0.5	VT/BN	3333	Brake Pedal Travel Sensor 2 Signal	III	—
36	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	III	—
37	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	III	—
38	2.5	BK	250	Ground	I	—

K20 Engine Control Module X1



784851

Connector Part Information

Harness Type: Engine
OEM Connector: 34576-0703
Service Connector: 88988373
Description: 56-Way F 0.64 Series, Sealed (BU with BU Terminal Position Assurance)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575812	J-35616-64B (LT BU)	J-38125-11A	Not Available	Not Available	Not Available	Not Available

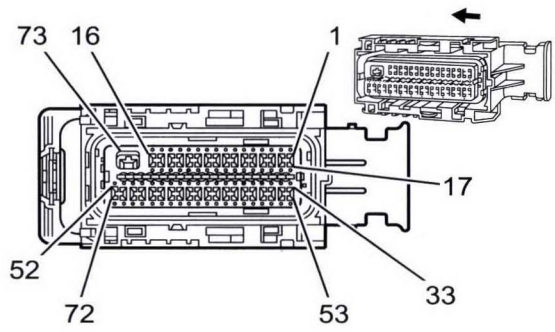
K20 Engine Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BU/BK	7493	High Speed GMLAN Serial Data (+)(3)	I	—
2	0.5	GN/WH	1162	Accelerator Pedal Position Signal (2)	I	—
3	—	—	—	Not Occupied	—	-
4	0.5	VT/WH	5981	PRNDL A Signal	I	—
5 - 7	—	—	—	Not Occupied	—	-
8	0.5	BN	3891	Aero Shutter Control	I	—
9	—	—	—	Not Occupied	—	-
10	0.5	YE/WH	1161	Accelerator Pedal Position Signal (1)	I	—
11	—	—	—	Not Occupied	—	-
12	0.5	GN	380	A/C Refrigerant Pressure Sensor Signal	I	—
13	0.5	BK/BN	5514	A/C Refrigerant Pressure Sensor Low Reference	I	—
14	—	—	—	Not Occupied	—	-
15	0.5	WH	7494	High Speed GMLAN Serial Data (-)(3)	I	—
16	0.5	BN/RD	1274	Accelerator Pedal Position 5 Volt Reference (2)	I	—
17	—	—	—	Not Occupied	—	-
18	0.5	BU/WH	3977	Accessory Wakeup Serial Data 2	I	—
19	0.75	VT/WH	239	Run/Crank Ignition 1 Voltage	I	—
20	0.75	RD/BU	840	Battery Positive Voltage	I	—
21 - 23	—	—	—	Not Occupied	—	-
24	0.5	WH/RD	1164	Accelerator Pedal Position 5 Volt Reference (1)	I	—

K20 Engine Control Module X1 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
25	—	—	—	Not Occupied	—	-
26	0.5	BN/RD	2700	A/C Pressure Sensor 5 Volt Reference	I	—
27 - 28	—	—	—	Not Occupied	—	-
29	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
30	0.5	BK/VT	1272	Accelerator Pedal Position Low Reference (2)	I	—
31 - 32	—	—	—	Not Occupied	—	-
33	0.5	WH/BU	6311	Cruise/ETC/TCC Brake Signal	I	—
34	0.5	GY/BN	5982	PRNDL B Signal	I	—
35 - 37	—	—	—	Not Occupied	—	-
38	0.5	BK/BU	1271	Accelerator Pedal Position Low Reference (1)	I	—
39 - 40	—	—	—	Not Occupied	—	-
41	0.5	BU/VT	2364	Cooling Fan Speed Signal	I	—
42	—	—	—	Not Occupied	—	-
43	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
44 - 46	—	—	—	Not Occupied	—	-
47	0.5	YE/VT	1262	Accessory Power Module Bit 0 Signal	I	—
48 - 51	—	—	—	Not Occupied	—	-
52	0.5	BN/WH	419	Check Engine Indicator Control	I	—
53 - 54	—	—	—	Not Occupied	—	-
55	0.5	BN	3891	Aero Shutter Control	I	—
56	—	—	—	Not Occupied	—	—

K20 Engine Control Module X2



1673472

Connector Part Information

Harness Type: Engine
OEM Connector: 34566-5043
Service Connector: 88988931
Description: 73-Way F 0.64, 2.8 Series, Sealed (BK with BK Terminal Position Assurance)

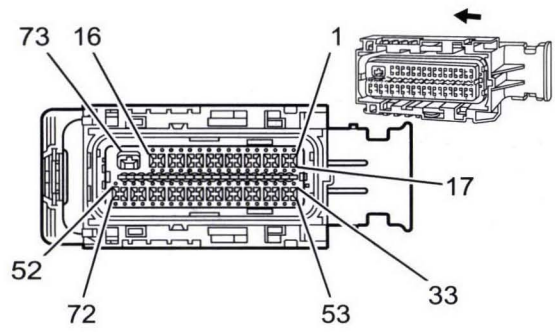
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575812	J-35616-64B (LT BU)	J-38125-11A	Not Available	Not Available	Not Available	Not Available
II	13579769	J-35616-35 (VT)	J-38125-11A	Not Available	Not Available	Not Available	Not Available

K20 Engine Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 30	—	—	—	Not Occupied	—	-
31	0.5	WH/BK	5983	PRNDL C Signal	I	—
32 - 72	—	—	—	Not Occupied	—	-
73	0.75	BK	350	Ground	II	—

K20 Engine Control Module X3



1673472

Connector Part Information

Harness Type: Engine
OEM Connector: 34566-5043
Service Connector: 88988931
Description: 73-Way F 0.64, 2.8 Series, Sealed (BK with BK Terminal Position Assurance)

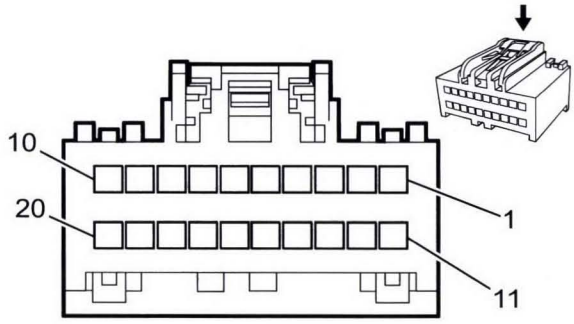
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575812	J-35616-64B (LT BU)	J-38125-11A	Not Available	Not Available	Not Available	Not Available
II	13579769	J-35616-35 (VT)	J-38125-11A	7116-4151-02	19	C	1

K20 Engine Control Module X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GY/WH	4168	PRNDL P Signal	I	—
2 - 16	—	—	—	Not Occupied	—	-
17	0.5	BN/GN	3793	Accessory Power Module Cooling Fan Feedback Signal	I	—
18 - 19	—	—	—	Not Occupied	—	-
20	0.5	BK/WH	3451	Signal Ground	I	—
21 - 30	—	—	—	Not Occupied	—	-
31	0.5	BK/BN	2761	Coolant Temperature Sensor Low Reference	I	—
32 - 46	—	—	—	Not Occupied	—	-
47	0.5	GN/VT	2032	Coolant Temperature Sensor Signal	I	—
48 - 72	—	—	—	Not Occupied	—	-
73	1	BK	50	Ground	II	—

K33 HVAC Control Module X1



2180227

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 31410-1203
Service Connector: 13576644
Description: 20-Way F 0.64 Series (GN with WH Terminal Position Assurance)

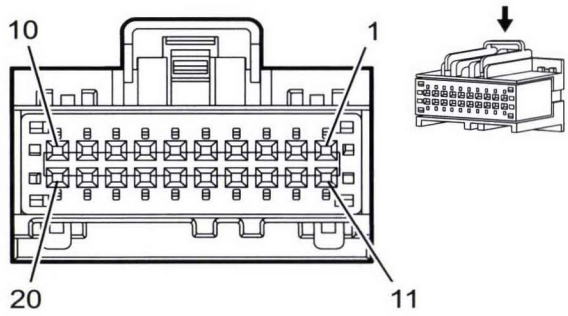
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575867	J-35616-64B (LT BU)	J-38125-215A	SAIT-A03T-M064	23	P	P

K33 HVAC Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	-
2	0.35	GY/BU	7564	Humidity Sensor Signal	I	—
3	—	—	—	Not Occupied	—	-
4	0.35	BU/WH	734	Inside Air Temperature Sensor Signal	I	—
5	0.35	YE/BU	3197	Humidity Temperature Sensor Signal	I	—
6	0.35	YE/RD	597	5 Volt Reference	I	—
7	0.35	BK/BN	6102	Inside Air Temperature Sensor Low Reference	I	—
8 - 11	—	—	—	Not Occupied	—	-
12	0.35	GY/GN	7565	Windscreen Temp Sensor Signal	I	—
13	—	—	—	Not Occupied	—	-
14	0.35	YE/VT	1783	Twilight Sentinel Delay Signal	I	—
15 - 17	—	—	—	Not Occupied	—	-
18	0.5	BN/BK	405	Lower Air Temperature Sensor Signal	I	—
19	0.35	GN	36	Coolant Temperature Signal	I	—
20	—	—	—	Not Occupied	—	—

K33 HVAC Control Module X2



1664553

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 31410-1202
Service Connector: 15126709
Description: 20-Way F 64 Series, Sealed (BN)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575867	J-35616-64B (LT BU)	J-38125-215A	SAIT-A03T-M064	23	P	P
II	13575867	J-35616-64B (LT BU)	J-38125-215A	SAIT-A03T-M064	23	P	P

K33 HVAC Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	RD/WH	2040	Battery Positive Voltage	I	-CW1
2	0.5	GN	5060	Low Speed GMLAN Serial Data	II	—
3	—	—	—	Not Occupied	—	-
4	0.5	GN/YE	7531	Local Interconnect Network Serial Data Bus 9	II	—
5 - 6	—	—	—	Not Occupied	—	-
7	0.5	VT/YE	3854	Cabin Heater Coolant Motor Control	II	—
8	0.75	BK	750	Ground	I	—
9	0.5	VT/BN	441	Run Ignition 3 Voltage	II	—
10 - 11	—	—	—	Not Occupied	—	-
12	0.5	BN/BU	3852	Cabin Heater Coolant Motor Feedback Signal	II	—
13 - 14	—	—	—	Not Occupied	—	-
15	0.5	BU/GY	754	Blower Motor Speed Control	II	—
16 - 18	—	—	—	Not Occupied	—	-
19	0.35	BN/VT	193	Rear Defog Relay Control	II	—
20	0.5	GN/GY	3853	Cabin Heater Coolant Motor Control	II	—

KR34B Hybrid/EV Battery Positive Contactor X2

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: Ring Terminal
Service Connector: Service by Harness - See Part Catalog
Description: Bus Bar

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR34B Hybrid/EV Battery Positive Contactor X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.8	YE	—	High Voltage Battery (+)	I	-

KR34B Hybrid/EV Battery Positive Contactor X3

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: Ring Terminal
Service Connector: Service by Harness - See Part Catalog
Description: Bus Bar

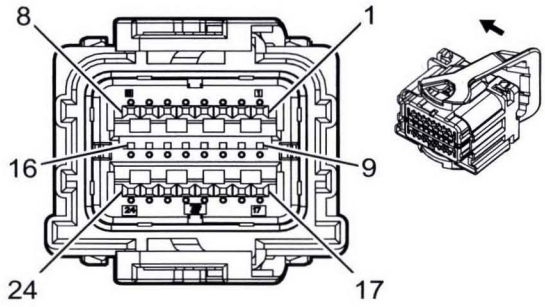
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR34B Hybrid/EV Battery Positive Contactor X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.8	RD	—	High Voltage Battery (+)	I	-

K36 Inflatable Restraint Sensing and Diagnostic Module X1



2829824

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 2098923-1
Service Connector: 19299778
Description: 24-Way F 0.64 Series, Sealed (YE)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	19328872	J-35616-64B (LT BU)	J-38125-11A	Not Available	Not Avail-able	Not Avail-able	Not Avail-able
II	19328872	J-35616-64B (LT BU)	J-38125-11A	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

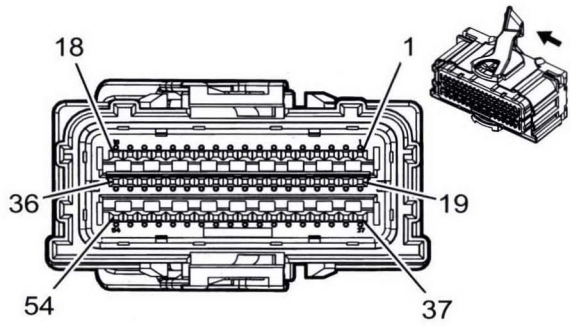
K36 Inflatable Restraint Sensing and Diagnostic Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/GN	3023	Steering Wheel Module Stage 2 High Control	I	AYF/AW7
2	0.5	WH/OG	3022	Steering Wheel Module Stage 2 Low Control	I	AYF/AW7
3	0.5	BN/OG	3020	Steering Wheel Module Stage 1 Low Control	I	AYF/AW7
4	0.5	OG/VT	3021	Steering Wheel Module Stage 1 High Control	I	AYF/AW7
5	0.5	YE/OG	3025	Passenger IP Module Stage 1 High Control	I	AYF/AW7
6	0.5	OG/WH	3024	Passenger IP Module Stage 1 Low Control	I	AYF/AW7
7	0.5	OG/VT	3026	Passenger IP Module Stage 2 Low Control	I	AYF/AW7
8	0.5	GY/OG	3027	Passenger IP Module Stage 2 High Control	I	AYF/AW7
9	0.5	RD/WH	640	Battery Positive Voltage	I	—
10	0.35	VT/WH	5234	Passenger Seat Belt Indicator Control	I	TFC
11	0.35	BU	2307	Passenger Air Bag On Indicator Control	I	ALO/C99
12	0.35	GN	2308	Passenger Air Bag Off Indicator Control	I	ALO/C99
13 - 14	—	—	—	Not Occupied	—	-
15	0.5	GN	5060	Low Speed GMLAN Serial Data	I	—
16	—	—	—	Not Occupied	—	-
17	0.5	WH/BU	5986	Serial Data Communication Enable	I	—
18	0.5	BU/YE	6105	High Speed GMLAN Serial Data (+) (2)	I	—
19	0.75	BK	1950	Ground	II	—
20	0.5	WH	6106	High Speed GMLAN Serial Data (-) (2)	I	—

K36 Inflatable Restraint Sensing and Diagnostic Module X1 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
21	0.5	OG/BU	3078	Driver Knee Module High Control	I	AYF
22	0.5	GY/OG	3079	Driver Knee Module Low Control	I	AYF
23	0.5	WH/OG	3077	Passenger Knee Module Low Control	I	AYF
24	0.5	OG/BU	3076	Passenger Knee Module High Control	I	AYF

K36 Inflatable Restraint Sensing and Diagnostic Module X2



2817420

Connector Part Information

Harness Type: Body
OEM Connector: 2098922-4
Service Connector: 19301193
Description: 54-Way F 0.64 Series, Sealed (YE)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	19328872	J-35616-64B (LT BU)	J-38125-11A	Not Available	Not Available	Not Available	Not Available

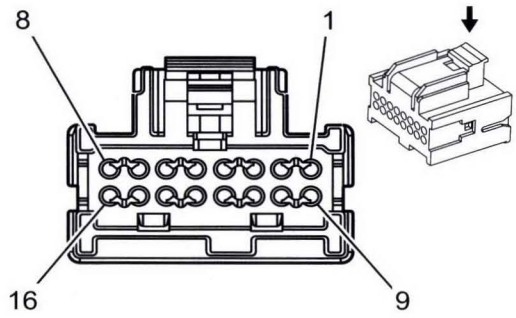
K36 Inflatable Restraint Sensing and Diagnostic Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	-
3	0.5	OG/GY	5226	Right Rear Side Impact SIR Inflator Control	I	AYF/AW7
4	0.5	VT/OG	5225	Right Rear Side Impact SIR Inflator Control	I	AYF/AW7
5 - 6	—	—	—	Not Occupied	—	-
7	0.5	BN/OG	5224	Left Rear Side Impact SIR Inflator Control	I	AYF/AW7
8	0.5	OG/GY	5223	Left Rear Side Impact SIR Inflator Control	I	AYF/AW7
9	0.5	OG/YE	3481	Driver Seat Belt Anchor Pretensioner High Control	I	AYF/AW7
10	0.5	YE/OG	3482	Driver Seat Belt Anchor Pretensioner Low Control	I	AYF/AW7
11	0.5	GY/OG	3480	Passenger Seat Belt Anchor Pretensioner Low Control	I	AYF/AW7
12	0.5	OG/BN	3479	Passenger Seat Belt Anchor Pretensioner High Control	I	AYF/AW7
13	0.5	OG/BU	3068	Driver Side Impact Module High Control	I	AYF/AW7
14	0.5	GN/OG	3069	Driver Side Impact Module Low Control	I	AYF/AW7
15	0.5	BN/OG	3067	Passenger Side Impact Module Low Control	I	AYF/AW7
16	0.5	OG/GY	3066	Passenger Side Impact Module High Control	I	AYF/AW7
17	0.5	OG/GN	5019	Left Front Head Curtain Module High Control	I	AYF/AW7
18	0.5	VT/OG	5020	Left Front Head Curtain Module Low Control	I	AYF/AW7
19	0.5	OG/GN	2132	Left Front Side Impact Sensing Module Signal	I	AYF/AW7

K36 Inflatable Restraint Sensing and Diagnostic Module X2 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
20	0.5	BK/OG	6628	Left Front Side Impact Sensing Module Low Reference	I	AYF/AW7
21	0.5	BK/OG	6629	Right Front Side Impact Sensing Module Low Reference	I	AYF/AW7
22	0.5	BN/OG	2134	Right Front Side Impact Sensing Module Signal	I	AYF/AW7
23	0.5	OG/YE	354	Left Front Discriminating Sensor Signal	I	D90
24	0.5	BK/OG	5045	Left Front Discriminating Sensor Low Reference	I	D90
25	0.5	BK/OG	5600	Right Front Discriminating Sensor Low Reference	I	D90+(AYF/AW7)
26	0.5	OG/GN	1409	Right Front Discriminating Sensor Signal	I	D90+(AYF/AW7)
27	0.5	OG/BU	6620	Left Middle Side Impact Sensing Module Signal	I	AYF/AW7
28	0.5	BK/OG	6621	Left Middle Side Impact Sensing Module Low Reference	I	AYF/AW7
29	0.5	BK/OG	6625	Right Middle Side Impact Sensing Module Low Reference	I	AYF/AW7
30	0.5	OG/VT	6624	Right Middle Side Impact Sensing Module Signal	I	AYF/AW7
31 - 36	—	—	—	Not Occupied	—	-
37	0.5	OG/WH	3477	Driver Seat Belt Retractor Pretensioner High Control	I	AWT
38	0.5	GY/OG	3478	Driver Seat Belt Retractor Pretensioner Low Control	I	AWT
39	0.5	WH/OG	3476	Passenger Seat Belt Retractor Pretensioner Low Control	I	AWS
40	0.5	OG/GN	3475	Passenger Seat Belt Retractor Pretensioner High Control	I	AWS
41	0.5	OG/BN	238	Driver Seat Belt Switch Signal	I	AYF/AW7
42	—	—	—	Not Occupied	—	-
43	0.5	BK/OG	1363	Driver Seat Belt Switch Low Reference	I	AYF/AW7
44	0.5	BK/OG	1361	Passenger Seat Belt Switch Low Reference	I	ALO+TFC +(AYF/AW7)
45	0.5	OG/VT	1362	Passenger Seat Belt Switch Signal	I	ALO+TFC +(AYF/AW7)
46 - 52	—	—	—	Not Occupied	—	-
53	0.5	OG/GY	5021	Right Front Head Curtain Module High Control	I	AYF/AW7
54	0.5	WH/OG	5022	Right Front Head Curtain Module Low Control	I	AYF/AW7

K41R Rear Parking Assist Control Module (UD7)



850856

Connector Part Information

Harness Type: Body Extension
OEM Connector: 15394150
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 16-Way F 0.64 Micro-Pack Series (BK)

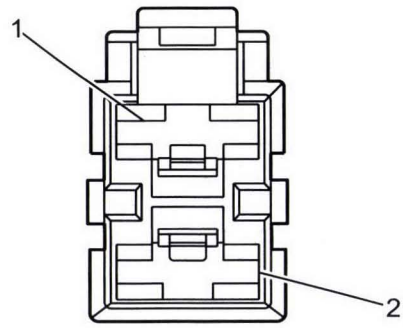
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

K41R Rear Parking Assist Control Module (UD7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	VT/BN	141	Run Ignition 3 Voltage	II	UD7
2	0.35	BK/YE	5248	Park Assist Alarm Low Reference	I	UD7
3	0.35	BU/YE	2380	Rear Parking Assist Chime Signal	I	UD7
4	0.5	GN/WH	24	Backup Lamp Control	II	UD7
5	—	—	—	Not Occupied	—	-
6	0.5	YE	2375	Left Rear Corner Object Sensor Signal	II	UD7
7	0.5	YE/VT	2378	Right Rear Corner Object Sensor Signal	II	UD7
8	—	—	—	Not Occupied	—	-
9	0.5	BK	1250	Ground	II	UD7
10	—	—	—	Not Occupied	—	-
11	0.35	YE	5247	Park Assist Alarm Signal	I	UD7
12	—	—	—	Not Occupied	—	-
13	0.5	BK/GY	2379	Object Sensor Low Reference	II	UD7
14 - 15	—	—	—	Not Occupied	—	-
16	0.5	BK/GY	2379	Object Sensor Low Reference	II	UD7

K43 Power Steering Control Module X1



1967359

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: MG610557
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 375 Series (NA)

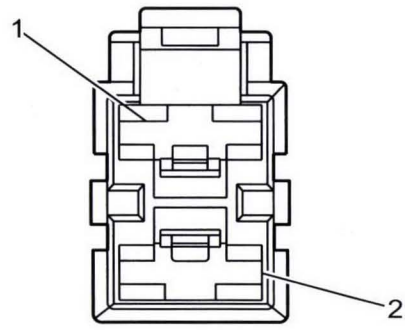
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-40 (BU)	Not Required	Not Required	Not Required	Not Required	Not Required

K43 Power Steering Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	8	RD/GN	1540	Battery Positive Voltage	I	—
2	8	YE/GN	1090	Passenger Door Lock Actuator Lock Control	I	—

K43 Power Steering Control Module X2



1967359

Connector Part Information

Harness Type: Power Steering
OEM Connector: MG610557
Service Connector: Serviced by Harness – See Part Catalog
Description: 2-Way F 375 Series (BU)

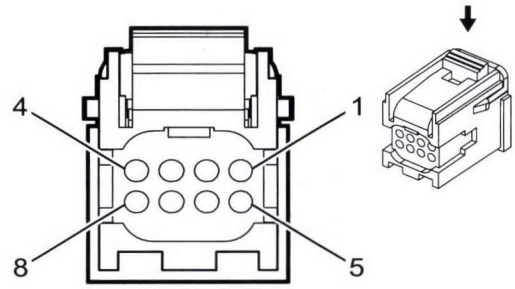
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Serviced by Harness – See Part Catalog	Not Available	Not Available	Not Available

K43 Power Steering Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	8	WH	—	Power Steering Motor Supply Voltage	I	NJ1
2	8	BK	—	Ground	I	NJ1

K43 Power Steering Control Module X3



2173890

Connector Part Information

Harness Type: Power Steering
OEM Connector: 13667007
Service Connector: Serviced by Harness – See Part Catalog
Description: 8-Way F Micro 64 Sries (BK)

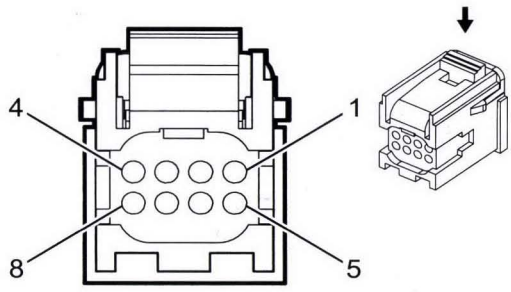
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575239	J-38125-21	J-35616-64B (L-BU)	15359541	22	M	M

K43 Power Steering Control Module X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG	-	V Torque Signal 2	I	NJ1
2	0.5	BN	-	V Torque Signal 2	I	NJ1
3	0.5	WH	-	Pulse Width Modulated	I	NJ1
4	0.5	GY	-	Ground	I	NJ1
5	0.5	RD	-	V Torque Signal 1	I	NJ1
6	0.5	BU	-	T Main	I	NJ1
7	0.5	YE	-	T Sub	I	NJ1
8	0.5	BK	-	Ground	I	NJ1

K43 Power Steering Control Module X4



2173890

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 15406142
Service Connector: 13337949
Description: 8-Way F 0.64 Micro-Pack Series (GY)

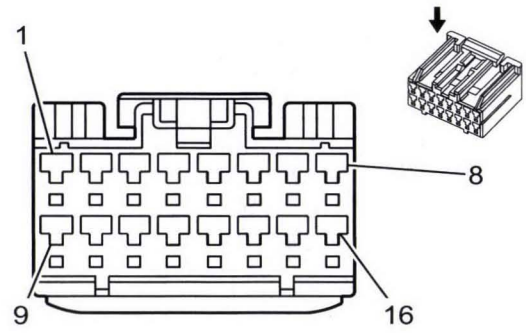
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

K43 Power Steering Control Module X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	WH/BU	5986	Serial Data Communication Enable	I	—
2	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
3	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
4 - 6	—	—	—	Not Occupied	—	-
7	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
8	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—

K73 Telematics Communication Interface Control Module X1 (UE1)



814530

Connector Part Information

Harness Type: Body
OEM Connector: 917981-1
Service Connector: 15306351
Description: 16-Way F 040, 070 Hybrid Series (WH)

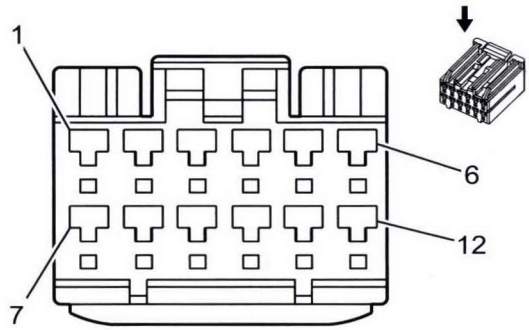
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575804	J-35616-16 (LT GN)	J-38125-559	15445905	8	J	J

K73 Telematics Communication Interface Control Module X1 (UE1)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GN	5060	Low Speed GMLAN Serial Data	I	UE1
2	0.35	BN/WH	2517	Keypad Red LED Control	I	UE1
3	0.35	YE/VT	2516	Keypad Green LED Control	I	UE1
4 - 5	—	—	—	Not Occupied	—	-
6	0.35	GN/BK	2515	Keypad Control	I	UE1
7	0.5	BK	650	Ground	I	UE1
8 - 9	—	—	—	Not Occupied	—	-
10	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	UE1
11	0.35	GN/WH	2514	Keypad Signal	I	UE1
12	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	UE1
13	0.5	BK/VT	5167	Battery Backup Low Reference	I	UE1
14	0.5	YE/VT	5235	Battery Backup Control	I	UE1
15	0.5	RD/YE	2340	Battery Positive Voltage	I	UE1
16	—	—	—	Not Occupied	—	—

K73 Telematics Communication Interface Control Module X2 (UE1)



814532

Connector Part Information

Harness Type: Body
OEM Connector: 917975-1
Service Connector: 88952886
Description: 12-Way F 040, 070 Hybrid Series (WH)

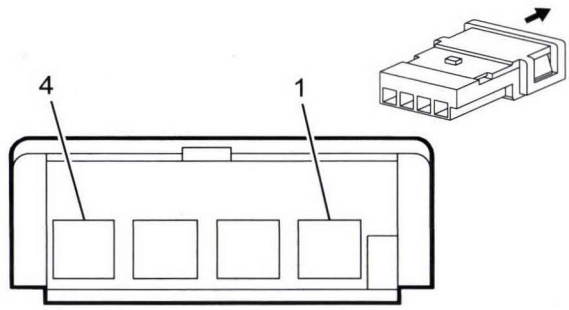
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575804	J-35616-16 (LT GN)	J-38125-559	15445905	8	J	J

K73 Telematics Communication Interface Control Module X2 (UE1)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	YE	658	Cellular Telephone Voice Signal	I	UE1
2	0.35	BK/YE	659	Cellular Telephone Voice Low Reference	I	UE1
3	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	UE1
4	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	UE1
5	0.5	BK	2550	Ground	I	UE1
6	0.35	BK/GY	5152	Voice Recognition Audio Low Reference	I	UE1
7	0.5	WH/BU	5986	Serial Data Communication Enable	I	UE1
8	0.5	BK/WH	551	Signal Ground	I	UE1
9	0.35	BU	655	Cellular Telephone Microphone Signal	I	UE1
10	0.35	BK/BN	654	Cellular Telephone Microphone Low Reference	I	UE1
11	—	—	—	Not Occupied	—	-
12	0.35	GY/YE	5149	Voice Recognition Audio Signal	I	UE1

K77 Remote Control Door Lock Receiver



872587

Connector Part Information

Harness Type: Body
OEM Connector: 968943-1
Service Connector: 13576534
Description: 4-Way F 0.64 Micro-Quadlock Series (BK)

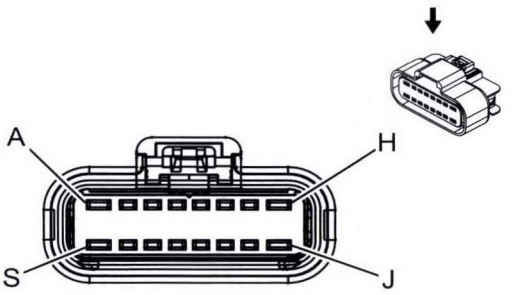
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

K77 Remote Control Door Lock Receiver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GY	3273	Remote Function Actuator Low Reference	I	—
2	0.35	BU/WH	3275	Remote Function Actuator Receive Signal	I	—
3	0.35	YE/GN	3274	Remote Function Actuator Transmit Signal	I	—
4	0.35	GY/WH	3272	Remote Function Actuator Control	I	—

K83 Parking Brake Control Module



2216895

Connector Part Information

Harness Type: Body
OEM Connector: 15479301
Service Connector: 15306348
Description: 16-Way F 150, 280 GT Series, Sealed (BK)

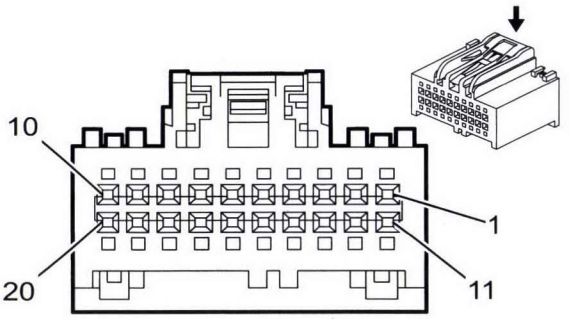
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575402	J-35616-4A (PU)	J-38125-553	Not Available	Not Available	Not Available	Not Available
II	13575412	J-35616-14 (GN)	J-38125-553	12191819	9	E	1
III	13576356	J-35616-4A (PU)	J-38125-553	15304719	14	E	5

K83 Parking Brake Control Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	4	RD/GN	40	Battery Positive Voltage	I	—
B	0.35	YE/RD	7683	Park Brake Release Switch Voltage Reference	II	—
C	0.35	BU/VT	1134	Park Brake Switch Signal	II	—
D	0.35	GY/RD	7684	Park Brake Apply Switch Voltage Reference	II	—
E	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	II	—
F	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	II	—
G	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	II	—
H	4	BK	50	Ground	I	—
J	—	—	—	Not Occupied	—	—
K	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	II	—
L	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	II	—
M	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	II	—
N	0.35	YE	1492	Park Brake Switch Supply Voltage	II	—
P	0.5	WH/BU	5986	Serial Data Communication Enable	II	—
R	0.35	BN	6107	Park Brake Apply Switch Signal	II	—
S	0.35	BU/BK	6108	Park Brake Release Switch Signal	III	—

K84 Keyless Entry Control Module X1



1715223

Connector Part Information

Harness Type: Body
OEM Connector: 31410-1200
Service Connector: 15126711
Description: 20-Way F 64 Series, Sealed (BK with WH Terminal Position Assurance)

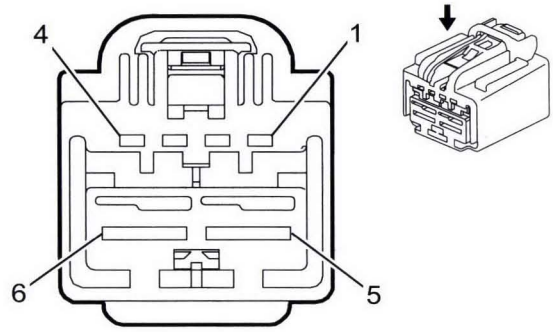
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575867	J-35616-64B (LT BU)	J-38125-215A	SAIT-A03T-M064	23	P	P

K84 Keyless Entry Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	-
3	0.5	GN	5060	Low Speed GMLAN Serial Data	I	BTM
4 - 10	—	—	—	Not Occupied	—	-
11	0.35	GN/BK	3558	Passive Start Switch Signal 2	I	BTM
12	0.35	BK/GY	3559	Passive Start Switch 2 Low Reference	I	BTM
13 - 14	—	—	—	Not Occupied	—	-
15	0.5	GY/BK	3555	Passive Start Interior Antenna 2 Signal Lo	I	BTM
16 - 17	—	—	—	Not Occupied	—	-
18	0.5	BN/BK	3552	Passive Start Interior Antenna 1 Signal Hi	I	BTM
19	0.5	WH	3553	Passive Start Interior Antenna 1 Signal Lo	I	BTM
20	0.5	BU	3554	Passive Start Interior Antenna 2 Signal Hi	I	BTM

K84 Keyless Entry Control Module X2



1798802

Connector Part Information

Harness Type: Body
OEM Connector: 7283-9749-30
Service Connector: 88988512
Description: 6-Way F YESC Kaizen Series (BK)

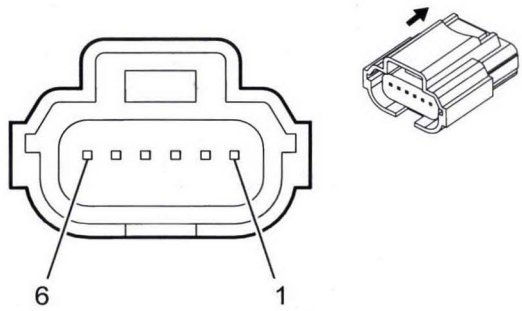
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-42 (RD)	Not Required	Not Required	Not Required	Not Required	Not Required

K84 Keyless Entry Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	RD/GY	1042	Battery Positive Voltage	I	BTM
2	0.5	BK	1350	Ground	I	BTM
3	0.35	VT/YE	4	Accessory Ignition Voltage	I	BTM
4	0.35	VT/BK	3	Run/Crank Ignition 1 Voltage	I	BTM
5	0.5	RD/GY	1042	Battery Positive Voltage	II	BTM
6	0.5	BK	1350	Ground	II	BTM

K85 Passenger Presence Module (AYF)



2817419

Connector Part Information

Harness Type: Body
OEM Connector: 31403-6110
Service Connector: 13580878
Description: 6-Way F 0.64 Series, Sealed (BK)

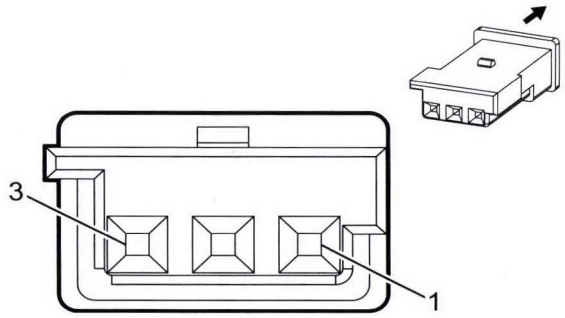
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

K85 Passenger Presence Module (AYF)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	RD/WH	740	Battery Positive Voltage	I	AYF
2	0.5	GN	5060	Low Speed GMLAN Serial Data	I	AYF
3	-	-	-	Not Occupied	-	-
4	0.5	BK	650	Ground	I	AYF
5	0.5	BN	3485	Seat Belt Switch +	I	AYF
6	0.5	BK	3486	Seat Belt Switch –	I	AYF

K89 Immobilizer Control Module



2179789

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 4-1718346-1
Service Connector: 13576530
Description: 3-Way F 0.64 Micro-Quadlock Series (PU)

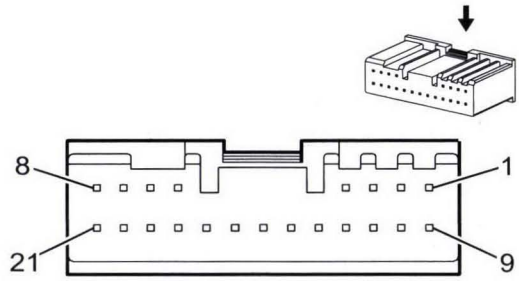
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

K89 Immobilizer Control Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GN/GY	3277	Vehicle Anti-Theft System Immobilizer Low Reference	I	—
2	0.35	GN/VT	7533	Local Interconnect Network Serial Data Bus 11	I	—
3	0.35	GY/BK	3276	Vehicle Anti-Theft System Immobilizer Control	I	—

K112 Hybrid/EV Battery Interface Control Module X13



2474674

Connector Part Information

Harness Type: Cell Voltage Monitor
OEM Connector: 13872755
Service Connector: Service by Harness - See Part Catalog
Description: 21-Way F 0.64 Series (OG)

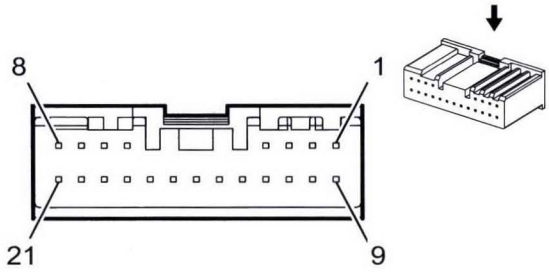
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327119	J-35616-64B (L-BU)	J-38125-215A	SAIT-A03T-M064	14	P	P

K112 Hybrid/EV Battery Interface Control Module X13

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1-8	-	-	-	Not Occupied	-	-
9	0.35	D-BU/BK	2392	Battery Cell Voltage Signal (92)	I	-
10	0.35	L-GN/VT	2391	Battery Cell Voltage Signal (91)	I	-
11	0.35	WH/BK	2390	Battery Cell Voltage Signal (90)	I	-
12	0.35	BN/WH	2389	Battery Cell Voltage Signal (89)	I	-
13	0.35	D-BU/YE	4577	Battery Cell Voltage Signal (88)	I	-
14	0.35	BN/WH	4576	Battery Cell Voltage Signal (87)	I	-
15	0.35	WH/BK	4575	Battery Cell Voltage Signal (86)	I	-
16	0.35	YE	4574	Battery Cell Voltage Signal (85)	I	-
17	0.35	YE/GY	4573	Battery Cell Voltage Signal (84)	I	-
18	0.35	BN	4572	Battery Cell Voltage Signal (83)	I	-
19	0.35	L-GN/GY	4571	Battery Cell Voltage Signal (82)	I	-
20	0.35	D-BU/GY	4570	Battery Cell Voltage Signal (81)	I	-
21	0.35	L-GN/BK	4569	Battery Cell Voltage Signal (80)	I	-

K112 Hybrid/EV Battery Interface Control Module X14



2474725

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 33115094
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 21-Way F 0.64 Series (BK)

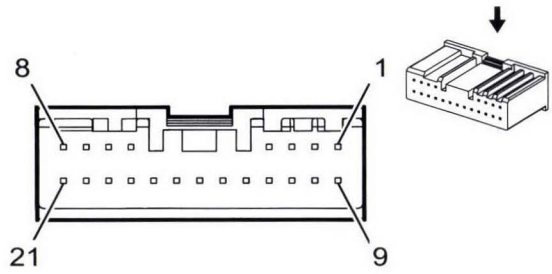
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

K112 Hybrid/EV Battery Interface Control Module X14

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 8	—	—	—	Not Occupied	—	-
9	0.35	GY/RD	705	5 Volt Reference	I	—
10	0.35	D-BU/GY	6434	CAN Bus High 2 Serial Data	I	—
11	0.35	WH	6435	CAN Bus Low 2 Serial Data	I	—
12	0.35	BK	2050	Ground	I	—
13	0.35	D-BU/GY	5139	High Voltage Fault Signal	I	—
14 - 21	—	—	—	Not Occupied	—	—

K112 Hybrid/EV Battery Interface Control Module X36



2474725

Connector Part Information

Harness Type: Low Voltage
OEM Connector: 33115094
Service Connector: Service by Harness - See Part Catalog
Description:21-Way F 0.64 Series (BK)

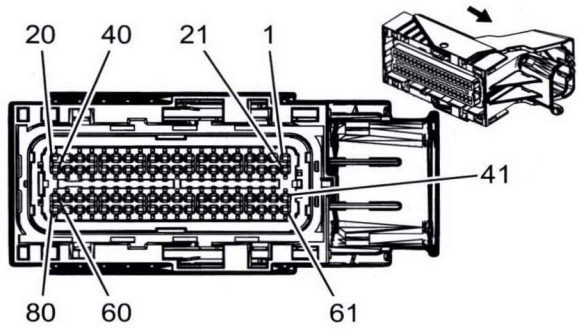
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327119	J-35616-64B (L-BU)	J-38125-215A	SAIT-A03T-M064	14	P	P

K112 Hybrid/EV Battery Interface Control Module X36

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1-8	-	-	-	Not Occupied	-	-
9	0.35	GY/RD	705	5 Volt Reference	I	-
10	0.35	D-BU/GY	6434	CAN Bus High #2 Serial Data	I	-
11	0.35	WH	6435	CAN Bus Low #2 Serial Data	I	-
12	0.35	BK	2050	Ground	I	-
13	0.35	D-BU/GY	5139	High Voltage Fault Signal	I	-
14 — 21	—	—	—	Not Occupied	—	—

K114B Hybrid/EV Powertrain Control Module 2 X1



2474736

Connector Part Information

Harness Type: Body
OEM Connector: 34566-0703
Service Connector: 13577545
Description: 80-Way F MX123 Series, Sealed (BK with BU Terminal Position Assurance)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13582310	J-35616-16 (LT GN)	J-38125-213	33468-0001	21	H	H
II	13575813	J-35616-16 (LT GN)	J-38125-213	33468-0003	19	J	J
III	13575813	J-35616-16 (LT GN)	J-38125-213	33468-0003	19	K	K

K114B Hybrid/EV Powertrain Control Module 2 X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	BK	2050	Ground	III	—
2	0.75	RD/BU	5240	Battery Positive Voltage	III	—
3	0.5	YE/VT	3962	High Voltage Battery 3 (+) Relay Control	II	—
4	0.35	GN/OG	3093	High Voltage Battery Cutoff Module Low Control	I	CBT
5	0.5	WH/BN	3963	High Voltage Battery 3 (-) Relay Control	II	—
6	0.5	VT/GY	3961	High Voltage Battery (-) Relay Control	II	—
7	0.35	OG/BU	3092	High Voltage Battery Cutoff Module High Control	I	CBT
8	0.5	WH/VT	5137	Precharge Relay PWM Signal	II	—
9	0.5	BN/GN	3959	High Voltage Battery 1 (+) Relay Control	II	—
10	0.5	GY/BU	3960	High Voltage Battery 2 (+) Relay Control	II	—
11	0.5	GN/VT	5243	Inside Rear View Mirror Potentiometer Ground	II	CBT
12 - 16	—	—	—	Not Occupied	—	-
17	0.5 0.5	BU BU	2500 2500	High Speed GMLAN Serial Data (+) (1)	II	UE1 -UE1
18	0.5 0.5	WH WH	2501 2501	High Speed GMLAN Serial Data (-) (1)	II	UE1 -UE1
19	—	—	—	Not Occupied	—	-
20	0.35	BK/YE	407	Sensor Low Reference	I	—

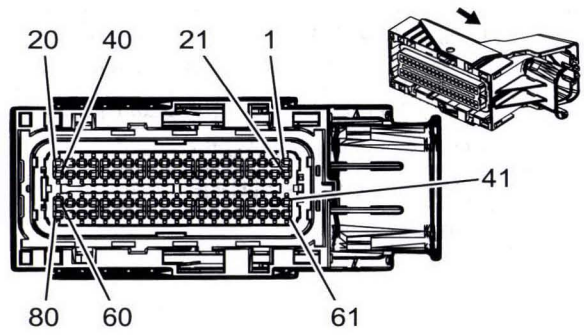
K114B Hybrid/EV Powertrain Control Module 2 X1 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
21 - 23	—	—	—	Not Occupied	—	-
24	0.35	BK/GY	3820	Rechargeable Energy Storage System Coolant HVAC Mode Sensor Low Reference	I	—
25	0.35	GN/YE	3822	Rechargeable Energy Storage System Coolant HVAC Mode Sensor Signal	I	—
26	0.35	BU/GY	636	Outside Ambient Air Temperature Sensor Signal	I	—
27	0.35	GN/VT	2032	Coolant Temperature Sensor Signal	I	—
28	0.5	VT/RD	2965	High Voltage Battery Current Sensor Voltage Reference	II	CBT
29	0.5	OG	7639	High Voltage Battery Pack Traction Power Inverter Module Positive Control	II	CBT
30	0.5	OG/BK	7644	High Voltage Battery Pack Traction Power Inverter Module Negative Control	II	CBT
31	0.35	BU	204	A/C Low Pressure Sensor Signal	I	—
32	0.5	BN/BN	1797	Coolant Level Sensor Signal	II	—
33	0.5	BK/BN	1798	Low Reference	II	—
34 - 36	—	—	—	Not Occupied	—	-
37	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	II	—
38	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	II	—
39	—	—	—	Not Occupied	—	-
40	0.35	BK/BU	61	Outside Ambient Temperature Sensor Low Reference	I	—
41 - 42	—	—	—	Not Occupied	—	-
43	0.5	YE/GY	5241	Inside Rear View Mirror Horizontal Potentiometer	II	CBT
44	—	—	—	Not Occupied	—	-
45	0.5	BK/BN	5088	High Voltage Interlock Loop Low Reference (1)	II	—
46	—	—	—	Not Occupied	—	-
47	0.5	VT	5087	High Voltage Interlock Loop Signal (1)	II	—
48 - 53	—	—	—	Not Occupied	—	-
54	0.5	WH	7494	High Speed GMLAN Serial Data (-)(3)	II	—
55	0.5	BU/BK	7493	High Speed GMLAN Serial Data (+)(3)	II	—
56	0.5	BU/BK	7493	High Speed GMLAN Serial Data (+)(3)	II	—
57	0.5	BU/GN	6433	CAN Bus High Serial Data	II	—
58	0.5	WH	6432	CAN Bus Low Serial Data	II	—
59	—	—	—	Not Occupied	—	-
60	0.35	BK/GN	476	Sensor Low Reference	I	—
61	—	—	—	Not Occupied	—	-
62	0.35	VT/RD	3821	Rechargeable Energy Storage System Coolant HVAC Mode Sensor 5 Volt Reference	I	—
63	0.35	BU/RD	474	5 Volt Reference	I	—
64	—	—	—	Not Occupied	—	-
65	0.5	BK/VT	5596	High Voltage Interlock Loop Low Reference (2)	II	—
66	—	—	—	Not Occupied	—	-
67	0.5	GY/VT	5595	High Voltage Interlock Loop Signal (2)	II	—
68 - 70	—	—	—	Not Occupied	—	-
71	0.5	VT/BN	3699	Charge Port Door Switch Signal	II	CBT
72 - 73	—	—	—	Not Occupied	—	-

K114B Hybrid/EV Powertrain Control Module 2 X1 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
74	0.5	BU/BK	7493	High Speed GMLAN Serial Data (+)(3)	II	—
75	0.5	WH	7494	High Speed GMLAN Serial Data (-)(3)	II	—
76	0.5	WH	7494	High Speed GMLAN Serial Data (-)(3)	II	—
77	0.5	BU/GN	6433	CAN Bus High Serial Data	II	—
78	0.5	WH	6432	CAN Bus Low Serial Data	II	—
79 - 80	—	—	—	Not Occupied	—	—

K114B Hybrid/EV Powertrain Control Module 2 X2



1830236

Connector Part Information

Harness Type: Body
OEM Connector: 34566-0803
Service Connector: 19115670
Description: 80-Way F 0.64 Series, Sealed (BK with GY Terminal Position Assurance)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13582310	J-35616-16 (LT GN)	J-38125-213	33468-0001	21	H	H
II	13575813	J-35616-16 (LT GN)	J-38125-213	33468-0003	19	J	J
III	13575813	J-35616-16 (LT GN)	J-38125-213	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

K114B Hybrid/EV Powertrain Control Module 2 X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	-
2	0.5	GN/VT	5092	Module Low Signal	II	CBT
3 - 4	—	—	—	Not Occupied	—	-
5	0.5	WH/GY	5239	Inside Rear View Mirror Vertical Potentiometer	II	CBT
6	0.5	GY/BU	213	Charge Port Paddle Temperature Sensor Signal	II	CBT
7	—	—	—	Not Occupied	—	-
8	0.5	GY/GN	3954	Control Pilot Signal 1	II	—
9	0.35	BU/VT	2364	Cooling Fan Speed Signal	I	—
10	0.5	BU/GY	5139	High Voltage Fault Signal	II	—
11 - 13	—	—	—	Not Occupied	—	-
14	0.35	VT/BU	3790	Electric Coolant Motor Feedback Signal	I	—
15	0.5	BU/YE	3953	Proximity Status Signal 1	II	—
16	0.5	BK/BU	5404	Charge Port Paddle Temperature Sensor Low Reference	II	CBT
17 - 19	—	—	—	Not Occupied	—	-
20	0.5	WH	5093	Module High Signal	II	CBT
21	0.35	BK/GN	3958	Charging Indicator Low Reference	I	—
22 - 24	—	—	—	Not Occupied	—	-

K114B Hybrid/EV Powertrain Control Module 2 X2 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
25	0.5	WH/BU	3697	Charge Port Door Sensor Signal	II	—
26	—	—	—	Not Occupied	—	-
27	0.35	VT/WH	639	Run/Crank Ignition 1 Voltage	III	—
28 - 32	—	—	—	Not Occupied	—	-
33	0.35	YE/GY	3796	Rechargeable Energy Storage System 1 Coolant Motor Feedback Signal	I	—
34 - 37	—	—	—	Not Occupied	—	-
38	0.5	GN	5060	Low Speed GMLAN Serial Data	II	—
39 - 40	—	—	—	Not Occupied	—	-
41	0.5	BN/YE	2231	Charge Port Valve Motor Close Control	II	CBT
42	0.35	WH/GN	3794	Rechargeable Energy Storage System 1 Coolant Motor Control	I	—
43 - 46	—	—	—	Not Occupied	—	-
47	0.35	BN/BU	3788	Electric Coolant Motor Control	I	—
48	0.5	BU/BN	3787	High Voltage Energy Management Communication Control	II	—
49 - 51	—	—	—	Not Occupied	—	-
52	0.35	WH	2368	Cooling Fan Control Signal	I	—
53	—	—	—	Not Occupied	—	-
54	0.5	VT	3195	Auxiliary Heater Control	II	—
55 - 58	—	—	—	Not Occupied	—	-
59	0.35	BU/VT	3818	Rechargeable Energy Storage System Coolant HVAC Mode Motor High Control	I	—
60	—	—	—	Not Occupied	—	-
61	0.5	BU/WH	2230	Charge Port Valve Motor Open Control	II	CBT
62	0.35	GY/GN	3957	Charging Pilot Signal Indicator Control	I	—
63	—	—	—	Not Occupied	—	-
64	0.35	YE/VT	3956	Charging Status Indicator Control	I	—
65 - 66	—	—	—	Not Occupied	—	-
67	0.35	VT/YE	5985	Accessory Wakeup Serial Data	I	—
68	—	—	—	Not Occupied	—	-
69	0.35	BU/WH	3977	Accessory Wakeup Serial Data 2	I	—
70 - 72	—	—	—	Not Occupied	—	-
73	0.35	BU/VT	3795	Rechargeable Energy Storage System 1 Coolant Motor Control	I	—
74	0.35	YE/GN	3789	Electric Coolant Motor Control	I	—
75 - 78	—	—	—	Not Occupied	—	-
79	0.35	WH/YE	3819	Rechargeable Energy Storage System Coolant HVAC Mode Motor Low Control	I	—
80	—	—	—	Not Occupied	—	—

KR116A Battery Charging System Negative Contactor X1

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1-Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR116A Battery Charging System Negative Contactor X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.8	BN	–	High Voltage Battery 3 (-) Relay Control	I	-

KR116A Battery Charging System Negative Contactor X2

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1-Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR116A Battery Charging System Negative Contactor X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.8	BK	—	High Voltage Battery 2 (-)	I	-

KR116A Battery Charging System Negative Contactor X5

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1-Way

KR116A Battery Charging System Negative Contactor X5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.8	GN	—	High Voltage Battery 3 Relay Control	I	-

KR116A Battery Charging System Negative Contactor X6

—

Connector Part Information

Harness Type: Low Voltage
OEM Connector: PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1-Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR116A Battery Charging System Negative Contactor X6

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.8	BK	2050	Ground	I	-

KR116B Battery Charging System Positive Contactor X1

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1-Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR116B Battery Charging System Positive Contactor X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.8	GY	—	High Voltage Battery 2 (+)	I	-

KR116B Battery Charging System Positive Contactor X2

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: JST PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1-Way Ring Terminal

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR116B Battery Charging System Positive Contactor X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.8	BK	—	Ground	I	-

KR117 Hybrid/EV Battery Multifunction Contactor X1

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1-Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR117 Hybrid/EV Battery Multifunction Contactor X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	RD	—	High Voltage Battery (+)	I	-

KR117 Hybrid/EV Battery Multifunction Contactor X2

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: JST PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1–Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR117 Hybrid/EV Battery Multifunction Contactor X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	GN	—	High Voltage Battery (+)	I	-

KR117 Hybrid/EV Battery Multifunction Contactor X5

—

Connector Part Information

Harness Type: Low Voltage
OEM Connector: PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1–Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR117 Hybrid/EV Battery Multifunction Contactor X5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BU	—	High Voltage Battery 2 (+) Relay Control	I	-

KR117 Hybrid/EV Battery Multifunction Contactor X6

—

Connector Part Information

Harness Type: Low Voltage
OEM Connector: PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1–Way

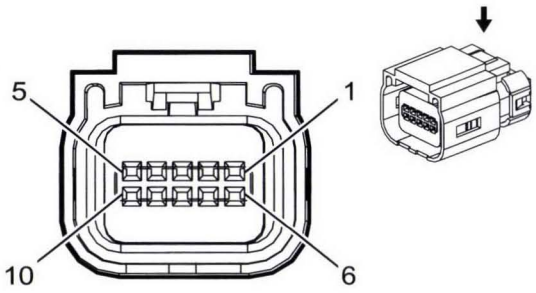
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR117 Hybrid/EV Battery Multifunction Contactor X6

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK	—	Ground	I	-

K132 Pedestrian Alert Sound Control Module



2586629

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 13569289
Service Connector: 19178082
Description: 10-Way F 0.64 Series, Sealed (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13579944	J-35616-64B (LT BU)	J-38125-215A	Not Available	Not Available	Not Available	Not Available

K132 Pedestrian Alert Sound Control Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
2	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
3	0.35	BK	750	Ground	I	—
4	0.5	WH/BU	5986	Serial Data Communication Enable	I	—
5	—	—	—	Not Occupied	—	-
6	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
7	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
8	0.5	GY/BK	1160	External Speaker Signal (-)	I	—
9	0.5	VT/WH	1159	External Speaker Signal (+)	I	—
10	0.35	RD/GN	1202	Battery Positive Voltage	I	—

KR134 Pre−Charge Contactor X1

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: JST PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1–Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR134 Pre−Charge Contactor X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	BU	—	High Voltage Battery (+)	I	-

KR134 Pre−Charge Contactor X2

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1−Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR134 Pre−Charge Contactor X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	YE	—	High Voltage Battery (+)	I	-

KR134 Pre−Charge Contactor X5

—

Connector Part Information

Harness Type: Low Voltage
OEM Connector: PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1–Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR134 Pre−Charge Contactor X5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG	—	Precharge Relay PWM Signal	I	-

KR134 Pre−Charge Contactor X6

—

Connector Part Information

Harness Type: Low Voltage
OEM Connector: PS-187
Service Connector: Service by Harness - See Part Catalog
Description: 1–Way

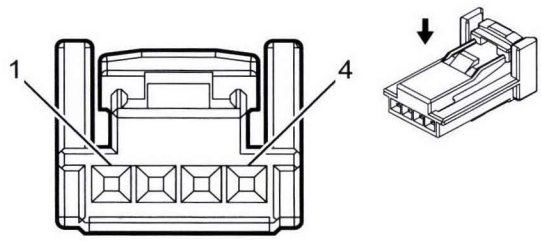
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

KR134 Pre−Charge Contactor X6

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK	—	Ground	I	-

K159 Hybrid/EV Battery Pack Coolant Heater Module X1



2434640

Connector Part Information

Harness Type: Low Voltage
OEM Connector: 1379658-1
Service Connector: Service by Harness - See Part Catalog
Description: 4-Way F 025 Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

K159 Hybrid/EV Battery Pack Coolant Heater Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK	2050	Ground	I	-
2	-	-	-	Not Occupied	-	-
3	0.5	YE	3185	Heater Control	I	-
4	0.5	RD/VT	1640	Battery Positive Voltage	I	-

K159 Hybrid/EV Battery Pack Coolant Heater Module X2

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: PS-250
Service Connector: Service by Harness - See Part Catalog
Description: 1–Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

K159 Hybrid/EV Battery Pack Coolant Heater Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	PK	—	Battery Pack Heater (-)	I	-

K159 Hybrid/EV Battery Pack Coolant Heater Module X3

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: PS-250
Service Connector: Service by Harness - See Part Catalog
Description: 1–Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

K159 Hybrid/EV Battery Pack Coolant Heater Module X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG	—	Battery Pack Heater (+)	I	-

K159 Hybrid/EV Battery Pack Coolant Heater Module X4

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: JST PS-250
Service Connector: Service by Harness - See Part Catalog
Description: 1–Way

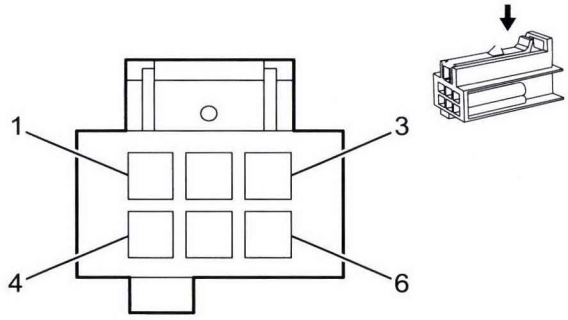
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

K159 Hybrid/EV Battery Pack Coolant Heater Module X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK	—	High Voltage (-)	I	-

M6 Air Temperature Door Actuator



2282896

Connector Part Information

Harness Type: HVAC
OEM Connector: 15338980
Service Connector: Service by Harness – See Part Catalog
Description: 6-Way F 0.64 MQS Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575782	J-35616-64B (L-BU)	J-38125-12A	Not Available	Not Available	Not Available	Not Available

M6 Air Temperature Door Actuator

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	D-GN	3169	Temp Door Stepper Motor Control (1)	I	—
2	0.35	OG	7572	HVAC Motor Supply Voltage	I	—
3	0.35	WH/PK	3170	Temp Door Stepper Motor Control (1)	I	—
4	0.35	GY/RD	3171	Temp Door Stepper Motor Control (4)	I	—
5	-	-	-	Not Occupied	-	-
6	0.35	RD/BK	3172	Temp Door Stepper Motor Control (2)	I	—

M7 Transmission Shift Lock Control Solenoid Actuator

—

Connector Part Information

Harness Type: Shift Lever
OEM Connector: Not Available
Service Connector: Service by Harness – See Part Catalog
Description: 2-Way M (WH)

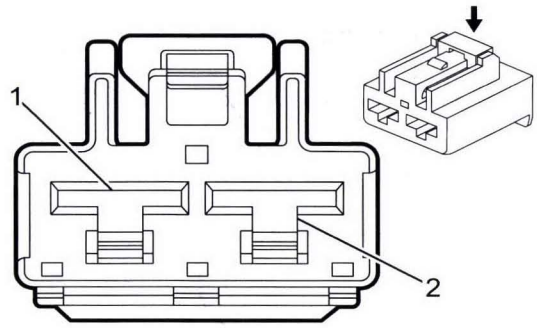
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

M7 Transmission Shift Lock Control Solenoid Actuator

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK	2250	Ground	I	-
2	0.5	RD	816	Brake Transmission Shift Interlock Solenoid Control	I	-

M8 Blower Motor



1664494

Connector Part Information

Harness Type: Blower Motor
OEM Connector: 6098–1104
Service Connector: 15193791
Description: 2-Way F (NA)

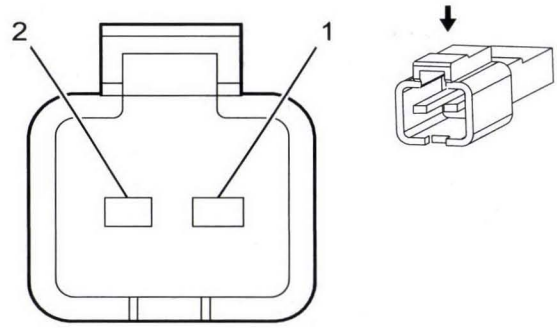
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

M8 Blower Motor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	4	VT	65	Blower Motor Supply Voltage	I	—
2	4	VT/BK	5987	Front Blower Motor Return	I	—

M14B Door Lock Actuator - Liftgate



2268767

Connector Part Information

Harness Type: Liftgate
OEM Connector: MG620490
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way M 090 Series (NA)

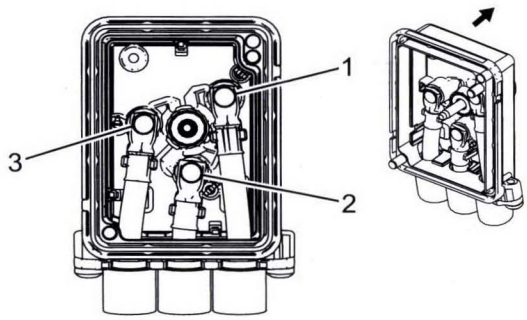
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-19 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required

M14B Door Lock Actuator - Liftgate

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GY	295	Door Lock Actuator Lock Control	I	A91
2	0.5	BN/YE	294	Door Lock Actuator Unlock Control	I	A91

M15 Drive Motor



2553164

Connector Part Information

Harness Type: High Voltage
OEM Connector: Not Available
Service Connector: Service by Harness – See Part Catalog
Description: 3-Way

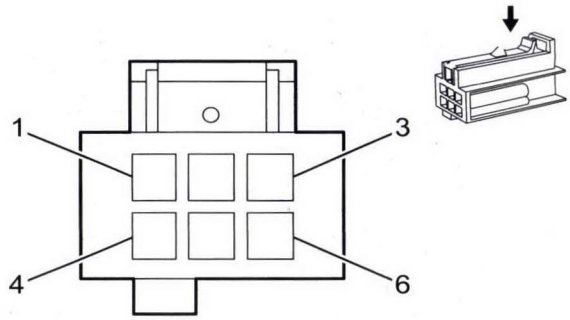
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	Not Available	Service by Harness – See Part Catalog	Not Available	Not Available	Not Available	Not Available

M15 Drive Motor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	35	OG	3770	Drive Motor 2 300V W Phase	I	—
2	35	OG	3771	Drive Motor 2 300V V Phase	I	—
3	35	OG	3772	Drive Motor 2 300V U Phase	I	—

M37 Mode Door Actuator



2282896

Connector Part Information

Harness Type: HVAC
OEM Connector: 15338980
Service Connector: Service by Harness – See Part Catalog
Description: 6-Way F 0.64 MQS Series (BK)

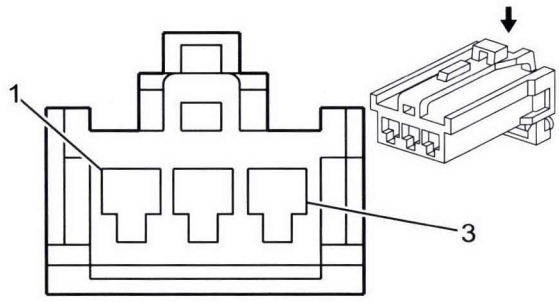
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575782	J-35616-64B (L-BU)	J-38125-12A	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

M37 Mode Door Actuator

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	YE	3167	Mode Door Stepper Motor Control (3)	I	—
2	0.35	OG	7572	HVAC Motor Supply Voltage	I	—
3	0.35	WH/RD	3165	Mode Door Stepper Motor Control (1)	I	—
4	0.35	GY/OG	3168	Mode Door Stepper Motor Control (4)	I	—
5	-	-	-	Not Occupied	-	-
6	0.35	D-GN/WH	3166	Mode Door Stepper Motor Control (2)	I	—

M45 Rear Wiper Motor



1467038

Connector Part Information

Harness Type: Liftgate
OEM Connector: MG610394
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 3-Way F 2.7 Series, Sealed (NA)

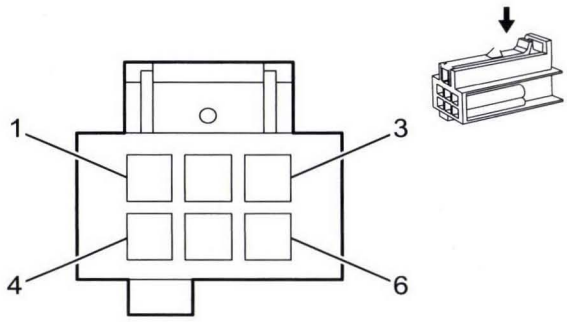
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-42 (RD)	No Tool Required	Not Required	Not Required	Not Required	Not Required

M45 Rear Wiper Motor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1	BK	1150	Ground	I	CD6
2	1	BU	393	Rear Window Wiper Motor Control	I	CD6
3	1	RD/VT	1640	Battery Positive Voltage	I	CD6

M46 Air Recirculation Door Motor



2282896

Connector Part Information

Harness Type: HVAC
OEM Connector: 15338980
Service Connector: Service by Harness – See Part Catalog
Description: 6-Way F 0.64 MQS Series (BK)

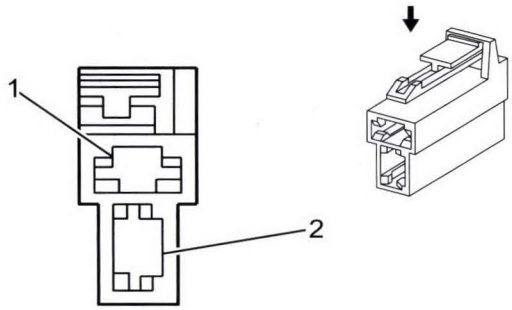
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575782	J-35616-64B (L-BU)	J-38125-12A	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

M46 Air Recirculation Door Motor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GY	3173	Air Inlet Door Stepper Motor Control (1)	I	—
2	0.35	OG	7572	HVAC Motor Supply Voltage	I	—
3	0.35	D-BU/WH	3174	Air Inlet Door Stepper Motor Control (1)	I	—
4	0.35	BN/D-GN	3175	Air Inlet Door Stepper Motor Control (4)	I	—
5	-	-	-	Not Occupied	-	-
6	0.35	RD/D-GN	3176	Air Inlet Door Stepper Motor Control (2)	I	—

M74D Window Motor - Driver



1467007

Connector Part Information

Harness Type: Driver Door
OEM Connector: MG610043-5
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 250 Series (BK)

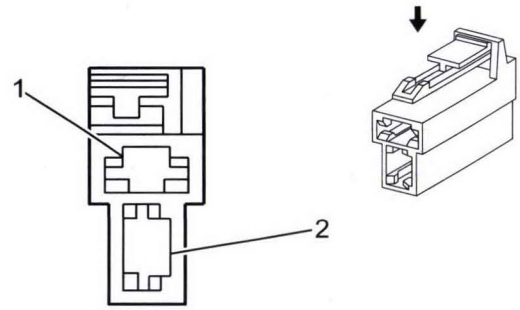
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-42 (RD)	No Tool Required	Not Required	Not Required	Not Required	Not Required

M74D Window Motor - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1.5	YE/VT	3383	Power Window Motor Driver Down Control	I	AE3
2	1.5	GN/GY	3382	Power Window Motor Driver Up Control	I	AE3

M74LR Window Motor - Left Rear



1467007

Connector Part Information

Harness Type: Left Rear Door
OEM Connector: MG610043-5
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 250 Series (BK)

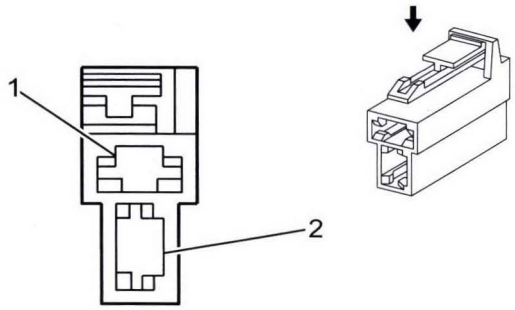
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-42 (RD)	No Tool Required	Not Required	Not Required	Not Required	Not Required

M74LR Window Motor - Left Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1.5	YE/BU	669	Power Window Motor Left Rear Down Control	I	AE3
2	1.5	BU/VT	668	Power Window Motor Left Rear Up Control	I	AE3

M74P Window Motor - Passenger



1467007

Connector Part Information

Harness Type: Passenger Door
OEM Connector: MG610043-5
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 250 Series (BK)

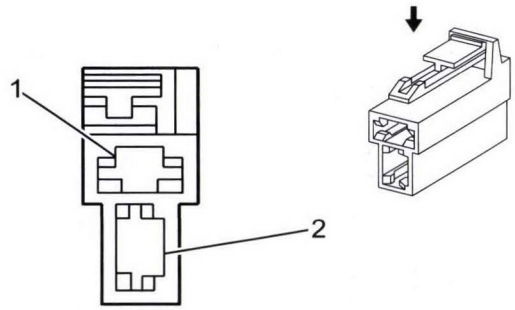
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-42 (RD)	No Tool Required	Not Required	Not Required	Not Required	Not Required

M74P Window Motor - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1.5	YE/BU	3388	Power Window Motor Passenger Down Control	I	AE3
2	1.5	GN/GY	3387	Power Window Motor Passenger Up Control	I	AE3

M74RR Window Motor - Right Rear



1467007

Connector Part Information

Harness Type: Right Rear Door
OEM Connector: MG610043-5
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 250 Series (BK)

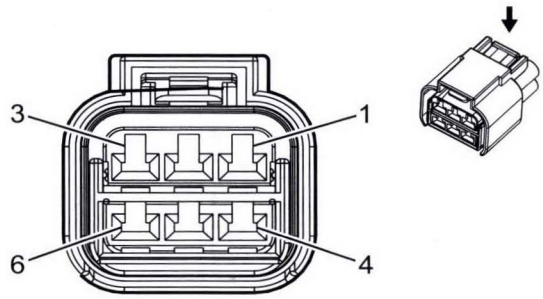
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-42 (RD)	No Tool Required	Not Required	Not Required	Not Required	Not Required

M74RR Window Motor - Right Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1.5	GN/BK	671	Power Window Motor Right Rear Down Control	I	AE3
2	1.5	BU/GY	670	Power Window Motor Right Rear Up Control	I	AE3

M75 Windshield Wiper Motor



4010419

Connector Part Information

Harness Type: Body
OEM Connector: 936257-2
Service Connector: 13577011
Description: 6-Way F 090 II Series (BK)

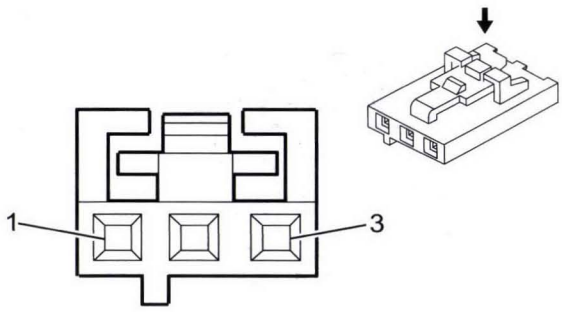
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-35 (VT)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-35 (VT)	Not Required	Not Required	Not Required	Not Required	Not Required

M75 Windshield Wiper Motor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	-
2	2	YE/BN	95	Windshield Wiper Motor Low Speed Control	I	—
3	2	WH	92	Windshield Wiper Motor High Speed Control	I	—
4	0.5	BN/GN	196	Windshield Wiper Motor Park Switch Signal	II	—
5	—	—	—	Not Occupied	—	-
6	2	BK	450	Ground	I	—

M77D Outside Rearview Mirror Motor - Driver



812599

Connector Part Information

Harness Type: Outside Rearview Mirror - Driver
OEM Connector: Not Available
Service Connector: Service by Assembly – See Part Catalog
Description: 3-Way F (BK)

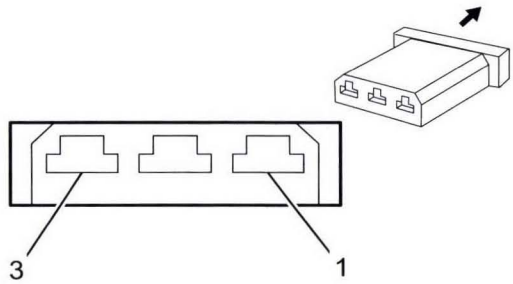
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Service by Assembly – See Part Catalog	Not Available	Not Available	Not Available	Not Available

M77D Outside Rearview Mirror Motor - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	D-GN/WH	81	Left Mirror Motor Right Control	I	—
2	0.35	WH	329	Left Mirror Motor Supply Voltage	I	—
3	0.35	D-BU/WH	88	Left Mirror Motor Up Control	I	—

M77P Outside Rearview Mirror Motor - Passenger



2484228

Connector Part Information

Harness Type: Passenger Outside Rearview Mirror
OEM Connector: 925–015
Service Connector: Service by Harness - See Part Catalog
Description: 3-way F (NA)

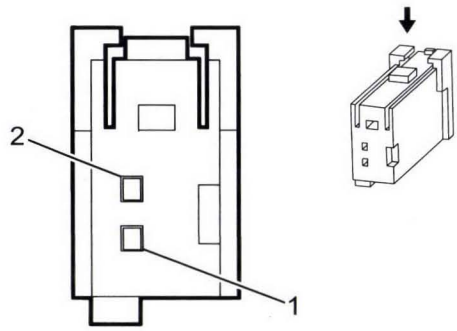
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Component Assembly	Not Available	Not Available	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

M77P Outside Rearview Mirror Motor - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	VT/WH	—	Right Mirror Motor Right Control	I	—
2	0.35	WH/BN	—	Right Mirror Motor Supply Voltage	I	—
3	0.35	GN/VT	—	Outside Right Mirror Vertical Position Control	I	—

M93 Key Capture Solenoid Actuator (-BTM)



2173598

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: AIT2PB-02A-1AK
Service Connector: 13314093
Description: 2-Way F 0.64 Series (BK)

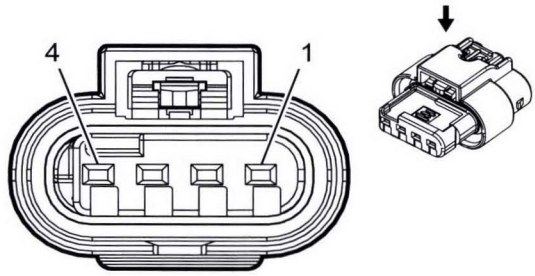
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

M93 Key Capture Solenoid Actuator (-BTM)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	VT/YE	143	Accessory Voltage	I	(MNG/M4M) (EF7/Z49)
2	0.35	WH/VT	5905	Key Capture/Column Lock Shift Position Signal	I	(MNG/M4M) (EF7/Z49)

M96 Active Grille Air Shutter Actuator



2596543

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 1-1456426-1
Service Connector: 19331705
Description: 4-Way F 1.2 Multiple Contact Point Series, Sealed (BK)

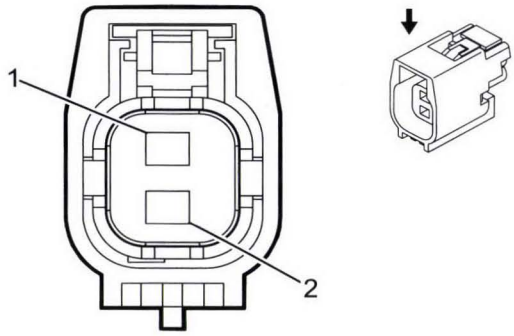
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

M96 Active Grille Air Shutter Actuator

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BN	3891	Aero Shutter Control	I	—
2	0.5	BK	750	Ground	I	—
3	0.5	VT/GN	839	Run/Crank Ignition 1 Voltage	I	—
4	—	—	—	Not Occupied	—	—

P12 Horn



2152684

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 7287-0973-30
Service Connector: 13586115
Description: 2-Way F 1.5 GT Series, Sealed (BK)

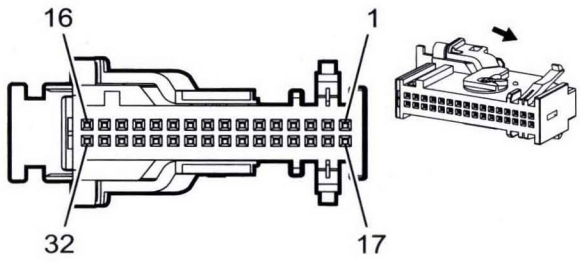
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

P12 Horn

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75 0.75	BK BK	50 50	Ground	I	U05 -U05
2	0.75 0.75	BN/GY BN/GY	29 29	Horn Control	I	U05 -U05

P16 Instrument Cluster



627214

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 968265-1
Service Connector: 88988405
Description: 32-Way F 0.64 Micro Quadlok Series (BK)

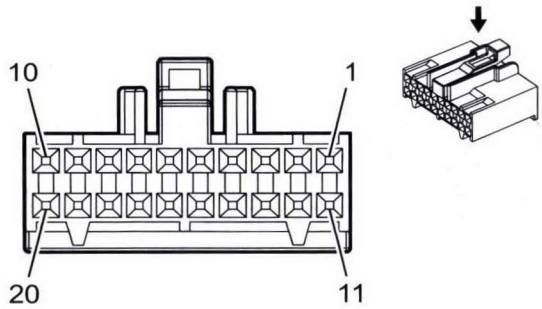
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575859	J-35616-64B (LT BU)	J-38125-12A	Not Available	Not Available	Not Available	Not Available

P16 Instrument Cluster

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	-
3	0.5	RD/VT	1940	Battery Positive Voltage	I	—
4 - 7	—	—	—	Not Occupied	—	-
8	0.35	YE/BN	3693	Driver Information Center Switch Minus Signal	I	—
9	0.35	BK/BN	897	Driver Information Center Switch Low Reference	I	—
10	0.35	GN/WH	1358	Driver Information Center Switch Signal	I	—
11 - 16	—	—	—	Not Occupied	—	-
17	0.5	GN	5060	Low Speed GMLAN Serial Data	I	—
18 - 22	—	—	—	Not Occupied	—	-
23	0.5	BK	750	Ground	I	—
24 - 25	—	—	—	Not Occupied	—	-
26	0.35	BK/GN	3694	Driver Information Center Switch Low Reference 2	I	—
27	—	—	—	Not Occupied	—	-
28	0.35	GY/VT	3692	Driver Information Center Switch Plus Signal	I	—
29	—	—	—	Not Occupied	—	-
30	0.5	BN/WH	419	Check Engine Indicator Control	I	—
31	0.5	VT/GY	139	Run/Crank Ignition 1 Voltage	I	—
32	—	—	—	Not Occupied	—	—

P17 Info Display Module



2813324

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 172047-2
Service Connector: 19301385
Description: 20-Way F 0.64 Series (BK)

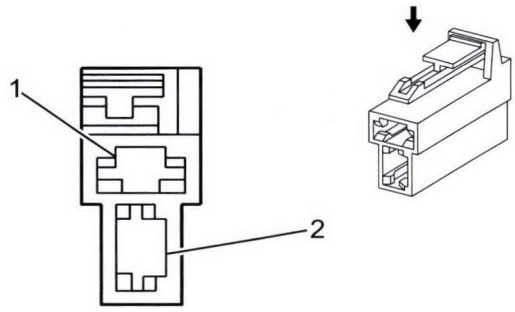
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13578839	J-35616-64B (LT BU)	J-38125-12A	Not Available	Not Available	Not Available	Not Available

P17 Info Display Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	VT/GY	139	Run/Crank Ignition 1 Voltage	I	—
2	—	—	—	Not Occupied	—	-
3	0.35	BU	2307	Passenger Air Bag On Indicator Control	I	ALO/C99
4	—	—	—	Not Occupied	—	-
5	0.35	BU	2307	Passenger Air Bag On Indicator Control	I	ALO/C99
6	0.35	GN	2308	Passenger Air Bag Off Indicator Control	I	ALO/C99
7	0.5	BK	750	Ground	I	—
8 - 10	—	—	—	Not Occupied	—	-
11	0.35	VT/WH	5234	Passenger Seat Belt Indicator Control	I	TFC
12	0.5	VT/WH	1139	Run/Crank Ignition 1 Voltage	I	(AL0/C99/TFC)
13 - 20	—	—	—	Not Occupied	—	—

P19J Speaker - Left Instrument Panel



1467007

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: MG610043
Service Connector: 13577009
Description: 2-Way F 250 Series (NA)

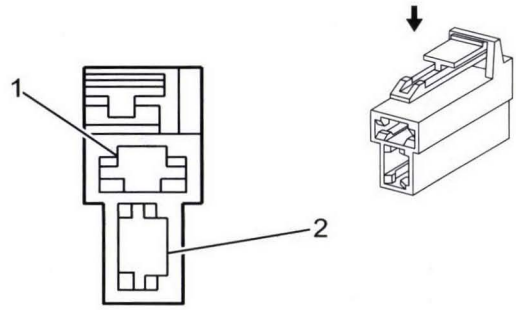
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-42 (RD)	Not Required	Not Required	Not Required	Not Required	Not Required

P19J Speaker - Left Instrument Panel

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	BN/BU	118	Left Front Speaker Signal (-) (1)	I	—
2	0.75	BU	201	Left Front Speaker Control (+) (1)	I	—

P19L Speaker - Left Rear Compartment



1467007

Connector Part Information

Harness Type: Body
OEM Connector: MG610043
Service Connector: 13577009
Description: 2-Way F 250 Series (NA)

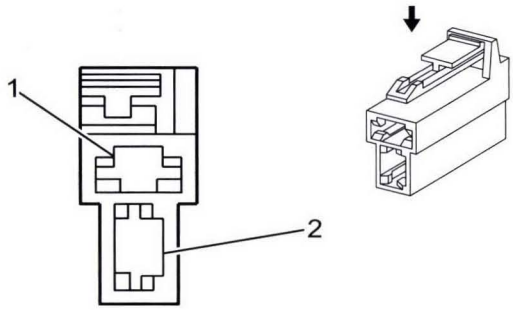
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-42 (RD)	Not Required	Not Required	Not Required	Not Required	Not Required

P19L Speaker - Left Rear Compartment

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	GN/BK	116	Left Rear Speaker Signal (-)	I	—
2	0.75	GN	199	Left Rear Speaker Control (+)	I	—

P19W Speaker - Right Instrument Panel



1467007

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: MG610043
Service Connector: 13577009
Description: 2-Way F 250 Series (NA)

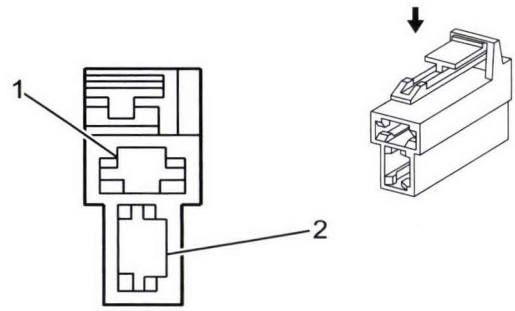
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-42 (RD)	Not Required	Not Required	Not Required	Not Required	Not Required

P19W Speaker - Right Instrument Panel

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	YE/BK	117	Right Front Speaker Signal (-) (1)	I	—
2	0.75	YE	200	Right Front Speaker Control (+) (1)	I	—

P19Y Speaker - Right Rear Compartment



1467007

Connector Part Information

Harness Type: Body
OEM Connector: MG610043
Service Connector: 13577009
Description: 2-Way F 250 Series (NA)

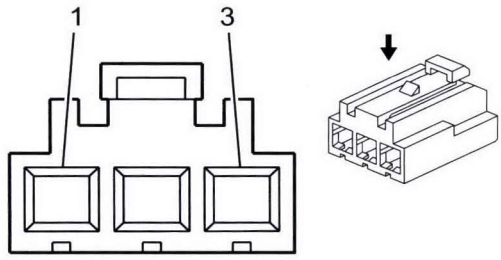
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-42 (RD)	Not Required	Not Required	Not Required	Not Required	Not Required

P19Y Speaker - Right Rear Compartment

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	BU/BK	115	Right Rear Speaker Signal (-)	I	—
2	0.75	WH	46	Right Rear Speaker Control (+)	I	—

P28 Speaker - Parking Assist (UD7)



2146466

Connector Part Information

Harness Type: Body Extension
OEM Connector: MG610209
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 3-Way F 118 (PA) Series (NA)

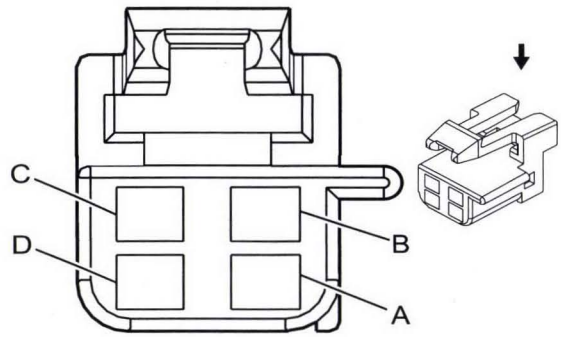
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-4A (PU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

P28 Speaker - Parking Assist (UD7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	BK/YE	5248	Park Assist Alarm Low Reference	I	UD7
2	0.35	YE	5247	Park Assist Alarm Signal	I	UD7
3	0.35	BU/YE	2380	Rear Parking Assist Chime Signal	I	UD7

P36 Battery State of Charge Indicator



130637

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 12064760
Service Connector: 13584477
Description: 4-Way F 150 Metri-Pack Series (BK)

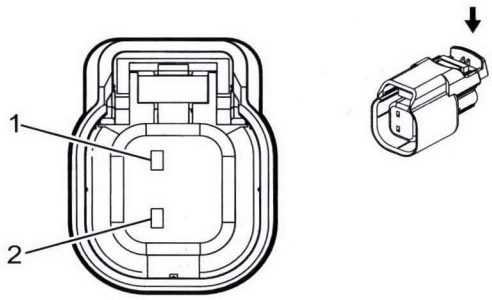
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

P36 Battery State of Charge Indicator

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.35	GY/GN	3957	Charging Pilot Signal Indicator Control	I	—
B	0.35	BK/GN	3958	Charging Indicator Low Reference	I	—
C	0.35	YE/VT	3956	Charging Status Indicator Control	I	—
D	0.35	WH/BN	3955	Charging Complete Indicator Control	I	—

P48 Pedestrian Alert Sound Speaker



2792100

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 34062-0023
Service Connector: 13505923
Description: 2-Way F 1.5 Series, Sealed (BK)

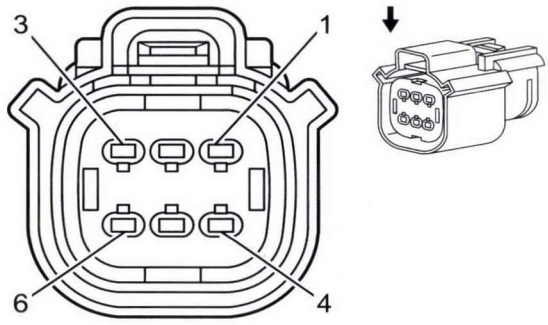
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-2A (GY)	Not Required	Not Required	Not Required	Not Required	Not Required

P48 Pedestrian Alert Sound Speaker

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GY/BK	1160	External Speaker Signal (-)	I	—
2	0.5	VT/WH	1159	External Speaker Signal (+)	I	—

Q65 Hybrid/EV Battery Pack Coolant Control Valve



1664625

Connector Part Information

Harness Type: Engine
OEM Connector: 33472-0611
Service Connector: 13585853
Description: 6-Way F 150 MX Series, Sealed (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-2A (GY)	Not Required	Not Required	Not Required	Not Required	Not Required

Q65 Hybrid/EV Battery Pack Coolant Control Valve

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BU/VT	3818	Rechargeable Energy Storage System Coolant HVAC Mode Motor High Control	I	—
2	0.5	WH/YE	3819	Rechargeable Energy Storage System Coolant HVAC Mode Motor Low Control	I	—
3	—	—	—	Not Occupied	—	-
4	0.5	GN/YE	3822	Rechargeable Energy Storage System Coolant HVAC Mode Sensor Signal	I	—
5	0.5	BK/GY	3820	Rechargeable Energy Storage System Coolant HVAC Mode Sensor Low Reference	I	—
6	0.5	VT/RD	3821	Rechargeable Energy Storage System Coolant HVAC Mode Sensor 5 Volt Reference	I	—

R25 Hybrid/EV Battery Pre−Charge Resistor X1

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: FPS-250
Service Connector: Service by Harness - See Part Catalog
Description: 1–Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

R25 Hybrid/EV Battery Pre−Charge Resistor X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BU	—	High Voltage (+)	I	-

R25 Hybrid/EV Battery Pre−Charge Resistor X2

—

Connector Part Information

Harness Type: High Voltage
OEM Connector: FPS-250
Service Connector: Service by Harness - See Part Catalog
Description: 1–Way

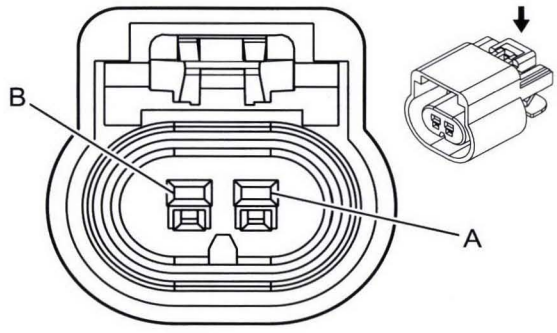
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

R25 Hybrid/EV Battery Pre−Charge Resistor X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GN	—	High Voltage (+)	I	-

R35 Manual Service Disconnect Resistor



523630

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 13510085
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 150 GT Series, Sealed (BK)

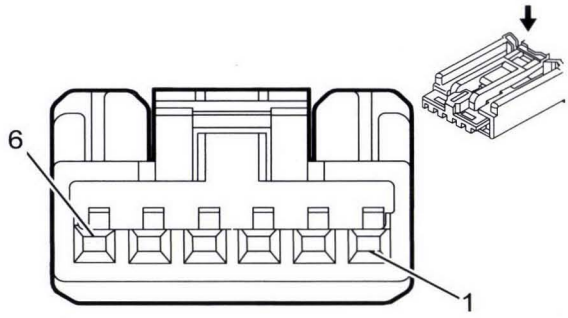
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-14 (GN)	Not Available	Not Available	Not Available	Not Available	Not Available

R35 Manual Service Disconnect Resistor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	VT/WH	5087	High Voltage Interlock Loop Signal (1)	I	—
B	0.5	VT	5087	High Voltage Interlock Loop Signal (1)	I	—

S3 Transmission Shift Lever



1862240

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: AIT2PB-06-1AK
Service Connector: 19167753
Description: 6-Way F 0.64 Kaizen Series (BK)

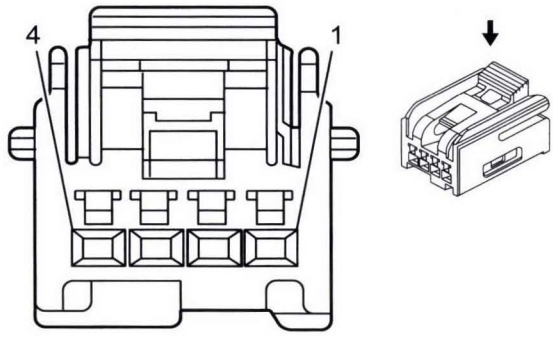
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

S3 Transmission Shift Lever

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	BK	1450	Ground	I	—
2	0.35	YE	6817	LED Backlight Dimming Control	I	—
3	0.5	VT/BK	7553	Park Lock Solenoid Control	I	—
4	0.5	BK	1450	Ground	I	—
5	0.35 0.35	WH/VT WH/VT	5905 5905	Key Capture/Column Lock Shift Position Signal	I	BTM -BTM
6	0.5	BK	1450	Ground	I	—

S13D Door Lock Switch - Driver (AU3)



1962077

Connector Part Information

Harness Type: Driver Door
OEM Connector: 13513469
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 4-Way F Micro HVT Series (BK)

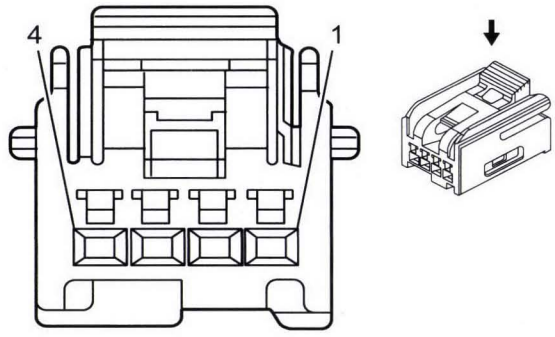
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required

S13D Door Lock Switch - Driver (AU3)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	YE	6817	LED Backlight Dimming Control	I	—
2	0.5	BN/WH	781	Driver Door Lock Switch Unlock Signal	I	—
3	0.5	BK	650	Ground	I	—
4	0.5	BN/YE	780	Driver Door Lock Switch Lock Signal	I	—

S13P Door Lock Switch - Passenger (AU3)



1962077

Connector Part Information

Harness Type: Passenger Door
OEM Connector: 13513469
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 4-Way F Micro HVT Series (BK)

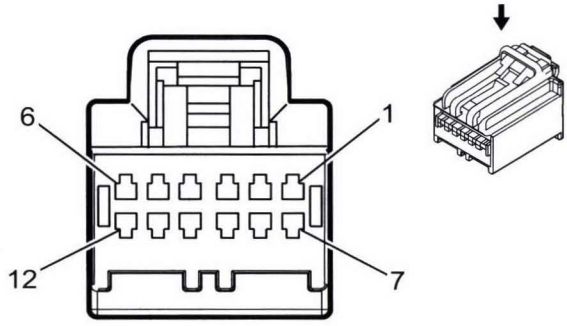
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required

S13P Door Lock Switch - Passenger (AU3)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	YE	6817	LED Backlight Dimming Control	I	EF7/Z49
2	0.5	BN/WH	781	Driver Door Lock Switch Unlock Signal	I	EF7/Z49
3	0.5	BK	650	Ground	I	EF7/Z49
4	0.5	BN/YE	780	Driver Door Lock Switch Lock Signal	I	EF7/Z49

S16 Driver Information Center Switch



3556661

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 31410-1121
Service Connector: 19151154
Description: 12-Way F 64 Series, Sealed (GY)

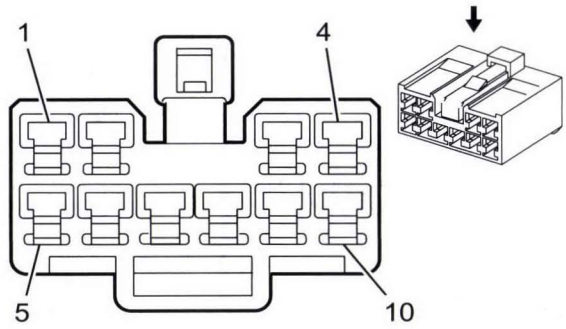
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575845	J-35616-64B (LT BU)	J-38125-215A	SAIT-A03T-M064	23	P	P
II	13575867	J-35616-64B (LT BU)	J-38125-215A	SAIT-A03T-M064	23	P	P

S16 Driver Information Center Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	-
2	0.35	GN/WH	1358	Driver Information Center Switch Signal	I	—
3	0.35	BK/BN	897	Driver Information Center Switch Low Reference	II	—
4	0.35	YE	6817	LED Backlight Dimming Control	II	—
5	0.35	BK	750	Ground	II	—
6	0.35	YE/BN	3692	Driver Information Center Switch Plus Signal	II	—
7	0.35	BK/GN	3693	Driver Information Center Switch Minus Signal	II	—
8	0.35	BN/YE	189	Headlamp Leveling Motor Control	II	TR6
9	0.35	VT/BK	339	Run/Crank Ignition 1 Voltage	II	TR6
10	0.35	YE/GY	44	Instrument Panel Lamp Dimmer Switch Signal	II	—
11	0.35	BU/RD	1688	5 Volt Reference	II	—
12	0.35	BK/YE	5005	Instrument Panel Lamp Dimmer Switch Low Reference	II	—

S26 Hazard Warning Switch



2268753

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: MG610056
Service Connector: 13584379
Description: 10-Way F (NA)

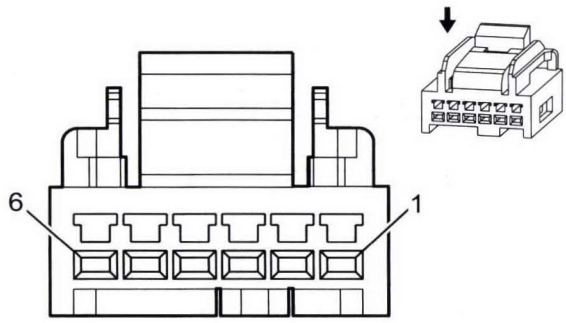
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	19331707	J-35616-18 (BK)	J-38125-553	7116-1180	22	C/E	C

S26 Hazard Warning Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	-
2	0.35	GY/YE	7543	Hazard LED Dimming Signal	I	—
3	0.35	BK	750	Ground	I	—
4 - 6	—	—	—	Not Occupied	—	-
7	0.35	GN/WH	111	Hazard Switch Signal	I	—
8	0.35	BK	750	Ground	I	—
9 - 10	—	—	—	Not Occupied	—	—

S32D Seat Heating Switch - Driver



1835121

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 15499927
Service Connector: 13577059
Description: 6-Way F Micro-Pack HVT Series (BK)

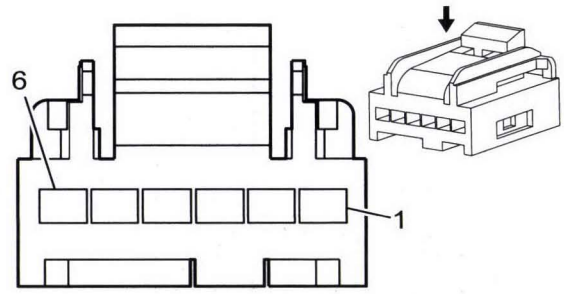
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

S32D Seat Heating Switch - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	BK	750	Ground	I	C37/C38
2	0.5	VT/BN	341	Run Ignition 3 Voltage	I	C37/C38
3	0.5	BN/GY	1462	Heated Seat Switch Signal	I	C37/C38
4	—	—	—	Not Occupied	—	-
5	0.35	BK	750	Ground	I	C37/C38
6	0.35	YE	6817	LED Backlight Dimming Control	I	C37/C38

S32P Seat Heating Switch - Passenger



1835126

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 15499929
Service Connector: 19301386
Description: 6-Way F Micro-Pack HVT Series (OG)

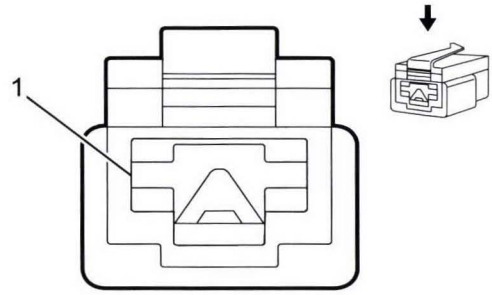
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	Not Required	Not Required	Not Required	Not Required	Not Required

S32P Seat Heating Switch - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	BK	750	Ground	I	C37/C38
2	0.5	VT/BN	341	Run Ignition 3 Voltage	I	C37/C38
3	0.5	YE/BU	1505	Passenger Heated Seat Switch Signal	I	C37/C38
4	—	—	—	Not Occupied	—	-
5	0.35	BK	750	Ground	I	C37/C38
6	0.35	YE	6817	LED Backlight Dimming Control	I	C37/C38

S33 Horn Switch



2292983

Connector Part Information

Harness Type: Steering Wheel
OEM Connector: 174196-1
Service Connector: Service by Harness– See Part Catalog
Description: 1-Way F 250 Series (NA)

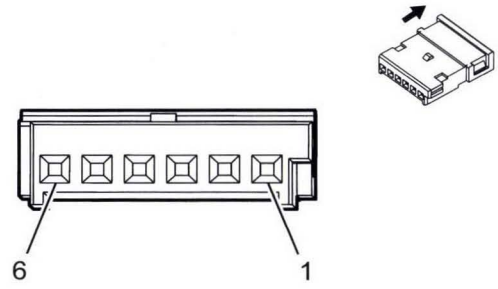
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-3 (GY)	J-38125-12A	Not Available	Not Available	Not Available	Not Available

S33 Horn Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK	3287	Horn Switch Signal	I	-

S39 Ignition Switch (-BTM)



2813308

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 936289-3
Service Connector: 19329943
Description: 6-Way F MQS Series (NA)

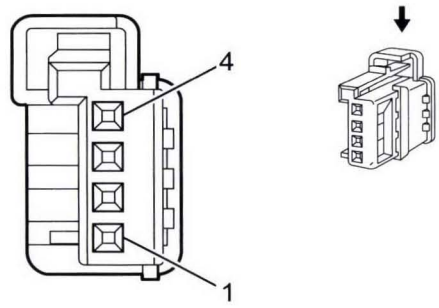
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

S39 Ignition Switch (-BTM)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	BK	850	Ground	I	—
2	0.35	WH/BK	1073	Ignition Key Resistor Signal	I	-BTM
3	0.35	WH/VT	1020	Off/Run/Crank Ignition Voltage	I	-BTM
4	0.35	VT/BK	3	Run/Crank Ignition 1 Voltage	I	-BTM
5	0.35	RD/GN	2440	Battery Positive Voltage	I	-BTM
6	0.35	VT/YE	4	Accessory Ignition Voltage	I	-BTM

S40 Passenger Air Bag Disable Switch



2179793

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 1379029-1
Service Connector: 13584096
Description: 4-Way F 0.64 Micro Quadlok Series (BK)

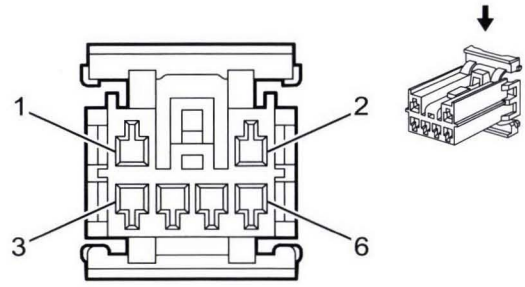
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-64B (L-BU)	Not Available	Not Available	Not Available	Not Available	Not Available

S40 Passenger Air Bag Disable Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	VT/OG	371	Passenger IP Module Disable Switch Signal	I	C99
2	-	-	-	Not Occupied	-	-
3	0.5	BU/OG	7328	Passenger IP Module Disable Switch Return	I	C99
4	-	-	-	Not Occupied	-	-

S46B Liftgate Unlatch Switch (Without AU3)



2268759

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: MG610398
Service Connector: NCSI
Description: 6-Way F 2.7 Series, Sealed (NA)

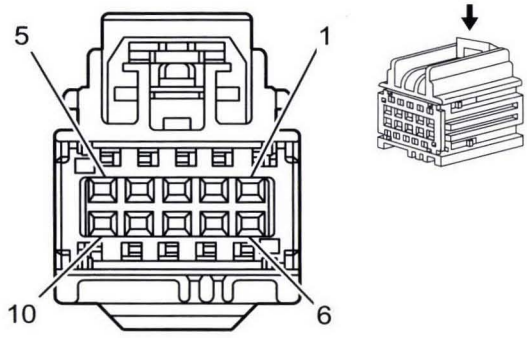
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

S46B Liftgate Unlatch Switch (Without AU3)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	-	-	-	Not Occupied	-	-
2	0.35	BU	5670	Gear Motor Module Lift Gate Close Signal	I	–
3	0.35	GN	5669	Gear Motor Module Lift Gate Open Signal	I	–
4	0.5	BK	850	Ground	I	–
5	0.35	YE	6817	LED Backlight Dimming Control	I	–
6	0.5	BK	850	Ground	I	–

S48E Multifunction Switch - Center Console



1664581

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 7283-9040-30
Service Connector: 15127042
Description: 10-Way F 0.64 YESC Kaizen Series (BK)

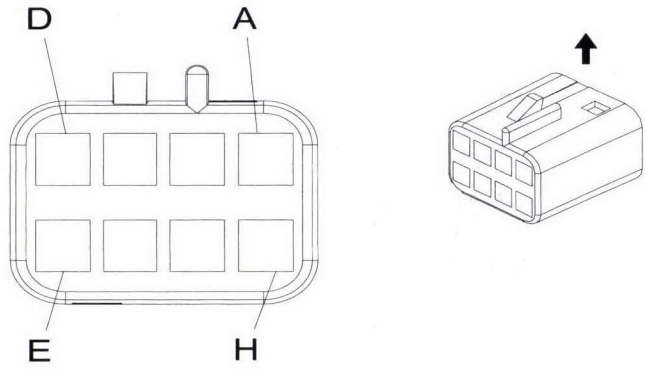
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

S48E Multifunction Switch - Center Console

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GY	5054	Sport Mode Switch Signal	I	—
2	0.35	BU/VT	1788	Traction Control Switch Signal (1)	I	—
3	0.35	YE	6817	LED Backlight Dimming Control	I	—
4	0.35	BK	1450	Ground	I	—
5-10	-	-	-	Not Occupied	-	-

S51 Telematics Button Assembly



62439

Connector Part Information

Harness Type: Body
OEM Connector: 12047886
Service Connector: 13584485
Description: 8-Way F 150 Metri-Pack Series (BK)

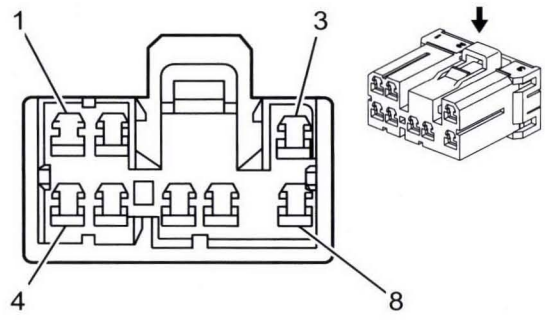
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required

S51 Telematics Button Assembly

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.35	GN/BK	2515	Keypad Control	I	UE1
B	0.35	GN/WH	2514	Keypad Signal	I	UE1
C - D	—	—	—	Not Occupied	—	-
E	0.35	BK	650	Ground	I	UE1
F	0.35	YE/VT	2516	Keypad Green LED Control	I	UE1
G	0.35	BN/WH	2517	Keypad Red LED Control	I	UE1
H	—	—	—	Not Occupied	—	—

S52 Outside Rearview Mirror Switch



1391782

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 173850-1
Service Connector: 88953352
Description: 8-Way F 070 Multilock Series (WH)

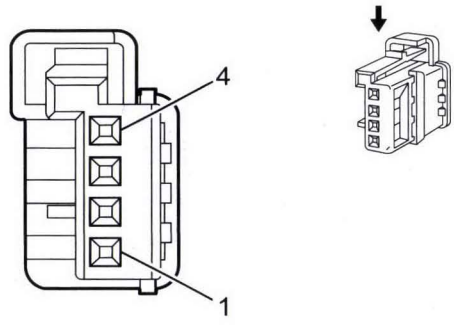
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-33 (YE)	Not Required	Not Required	Not Required	Not Required	Not Required

S52 Outside Rearview Mirror Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	YE/VT	3397	Passenger Mirror Motor Up (+) Down (-) Control	I	—
2	—	—	—	Not Occupied	—	-
3	0.5	VT/BU	3390	Driver Mirror Motor Up (+) Down (-) Control	I	—
4	0.5	YE/BN	3391	Driver Mirror Motor Common Control	I	—
5	0.5	GN/BK	3396	Passenger Mirror Motor Right (+) Left (-) Control	I	—
6	0.5	RD/VT	2640	Battery Positive Voltage	I	—
7	0.5	BN/BK	3389	Driver Mirror Motor Right (+) Left (-) Control	I	—
8	0.5	BK	1050	Ground	I	—

S70L Steering Wheel Controls Switch - Left (K34)



2490867

Connector Part Information

Harness Type: Steering Wheel
OEM Connector: 1379029
Service Connector: 13271140
Description: 4-Way F 0.64 Micro Quadlok Series (BK)

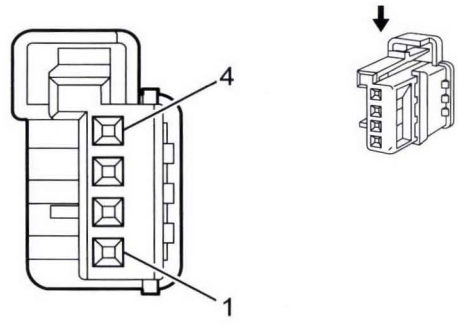
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Avail-able	J-35616-64B (L-BU)	J-38125-12A	928999-5	15	H	H

S70L Steering Wheel Controls Switch - Left (K34)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BU	6817	LED Backlight Dimming Control	I	-
2	0.5	BK/WH	750	Ground	I	-
3	0.5	RD	1884	Cruise Control Set/Coast/Resume/Accelerate Switch Signal	I	-
4	0.5	OG	1444	12 Volt Reference	I	-

S70R Steering Wheel Controls Switch - Right



2490867

Connector Part Information

Harness Type: Steering Wheel
OEM Connector: 1379029–1
Service Connector: 13271140
Description: 4-Way F 0.64 Micro Quadlok Series (NA)

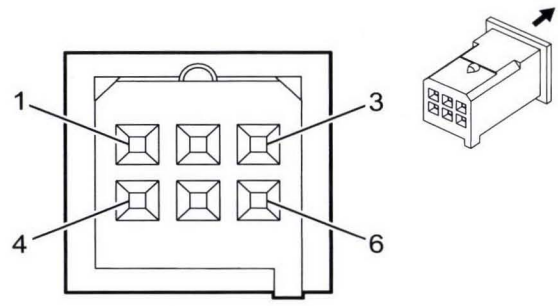
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Avail-able	J-35616-64B (L-BU)	J-38125-12A	928999-5	15	H	H

S70R Steering Wheel Controls Switch - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GN/WH	6817	LED Backlight Dimming Control	I	-
2	0.5	BK/WH	750	Ground	I	-
3	0.5	GY	6819	Steering Wheel Resistor Ladder Signal #2	I	-
4	0.5	YE	1444	12 Volt Reference	I	-

S75 Traction Control Switch



1697500

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 1-968291-2
Service Connector: 88988120
Description: 6-Way F 0.64 Micro Quadlok Series (BK)

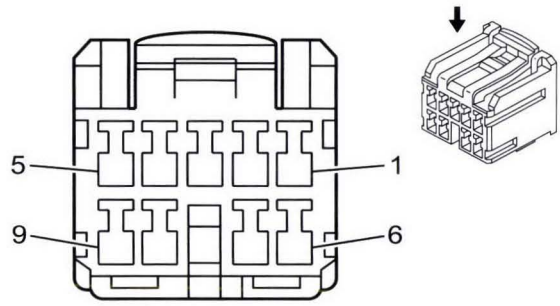
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575549	J-38125-559	J-35616-16 (L-GN)	15445905	8	J	J

S75 Traction Control Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	-	-	-	Not Occupied	-	-
2	0.35	BU/VT	1788	Traction Control Switch Signal	I	–
3	0.35	YE	6817	LED Backlight Dimming Control	I	–
4	0.35	BK	750	Ground	I	–
5-6	-	-	-	Not Occupied	-	-

S78 Turn Signal Multifunction Switch



1527732

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: HCMDPB-09-K
Service Connector: 89047304
Description: 9-Way F 0.64 HCM Series (BK)

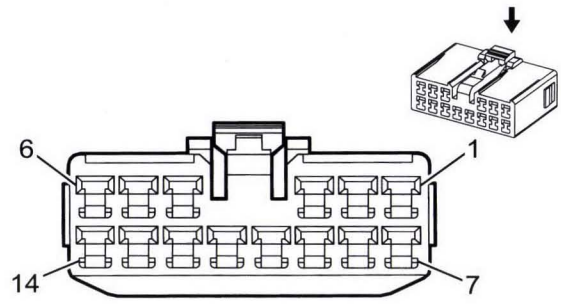
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13578839	J-35616-64B (LT BU)	J-38125-12A	SHCM-A03T-P025	21	J	J

S78 Turn Signal Multifunction Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	BK	750	Ground	I	—
2	0.35	GN/GY	13	Headlamp Switch Park Lamp Signal	I	—
3	0.35	WH/VT	103	Headlamp Switch On Signal	I	—
4	0.35	WH/GN	663	Hazard Switch Left Turn Signal	I	—
5	0.35	VT/BU	664	Hazard Switch Right Turn Signal	I	—
6	0.35	VT/YE	525	Headlamp Dimmer Switch Low Beam Signal	I	—
7	0.35	YE/BN	307	Headlamp Switch Flash To Pass Signal	I	—
8	—	—	—	Not Occupied	—	-
9	0.35 0.35	GN/BN BU/GY	306 187	Headlamp Switch Headlamps Off Signal Control Rear Fog Lamp Switch Signal	I	T83 -T83

S79D Window Switch - Driver



2268778

Connector Part Information

Harness Type: Driver Door
OEM Connector: MG651110
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 14-Way F 090 II Series (NA)

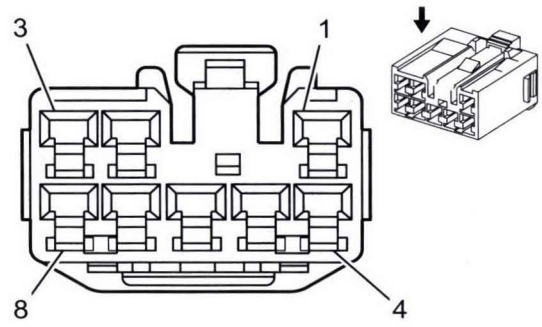
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-18 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required

S79D Window Switch - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1.5	BN/BU	1187	Power Window Switch Left Rear Down Signal	I	AE3
2	1.5	VT	1701	Retained Accessory Power Ignition	I	AE3
3	1.5	GN/GY	1185	Power Window Switch Left Rear Up Signal	I	AE3
4	1.5	BN/BU	1188	Power Window Switch Right Rear Down Signal	I	AE3
5	—	—	—	Not Occupied	—	-
6	1.5	GN/GY	1186	Power Window Switch Right Rear Up Signal	I	AE3
7	1.5	YE/VT	3383	Power Window Motor Driver Down Control	I	AE3
8	1.5	VT	1301	Retained Accessory Power Fuse Control	I	AE3
9	1.5	GN/GY	3382	Power Window Motor Driver Up Control	I	AE3
10	—	—	—	Not Occupied	—	-
11	1.5	BU/WH	1307	Power Window Master Switch Lockout Signal	I	AE3
12	1.5	BN/YE	3385	Power Window Switch Passenger Down Signal	I	AE3
13	1.5	BK	750	Ground	I	AE3
14	1.5	YE/BK	3384	Power Window Switch Passenger Up Signal	I	AE3

S79LR Window Switch - Left Rear



3996939

Connector Part Information

Harness Type: Left Rear Door
OEM Connector: MG651050
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 8-Way F 090 II Series (NA)

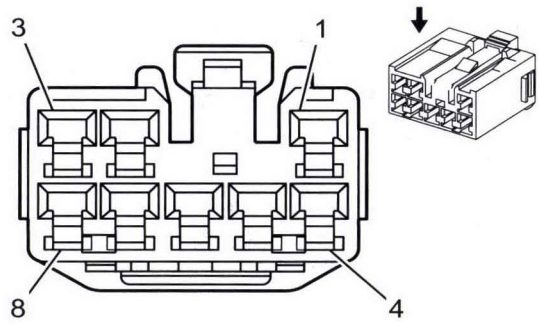
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-18 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required

S79LR Window Switch - Left Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1.5	BU/VT	668	Power Window Motor Left Rear Up Control	I	AE3
2	—	—	—	Not Occupied	—	-
3	1.5	YE/BU	669	Power Window Motor Left Rear Down Control	I	AE3
4	1.5	GN/GY	1185	Power Window Switch Left Rear Up Signal	I	AE3
5	—	—	—	Not Occupied	—	-
6	1.5	BU/WH	1307	Power Window Master Switch Lockout Signal	I	AE3
7	—	—	—	Not Occupied	—	-
8	1.5	BN/BU	1187	Power Window Switch Left Rear Down Signal	I	AE3

S79P Window Switch - Passenger



3996939

Connector Part Information

Harness Type: Passenger Door
OEM Connector: MG651050
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 8-Way F 090 II Series (NA)

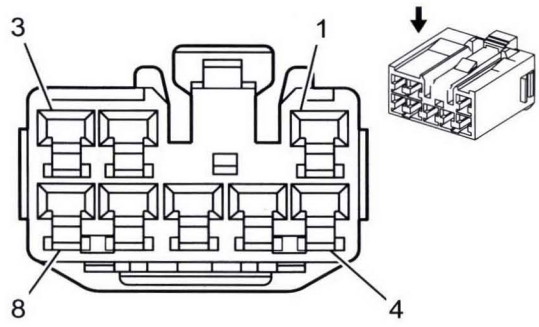
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-18 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required

S79P Window Switch - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1.5	GN/GY	3387	Power Window Motor Passenger Up Control	I	AE3
2	—	—	—	Not Occupied	—	-
3	1.5	YE/BU	3388	Power Window Motor Passenger Down Control	I	AE3
4	1.5	YE/BK	3384	Power Window Switch Passenger Up Signal	I	AE3
5	—	—	—	Not Occupied	—	-
6	1.5	VT	1301	Retained Accessory Power Fuse Control	I	AE3
7	—	—	—	Not Occupied	—	-
8	1.5	BN/YE	3385	Power Window Switch Passenger Down Signal	I	AE3

S79RR Window Switch - Right Rear



3996939

Connector Part Information

Harness Type: Right Rear Door
OEM Connector: MG651050
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 8-Way F 090 II Series (NA)

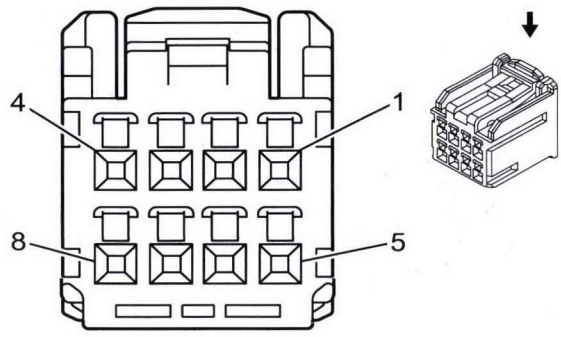
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-18 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required

S79RR Window Switch - Right Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	1.5	BU/GY	670	Power Window Motor Right Rear Up Control	I	AE3
2	—	—	—	Not Occupied	—	-
3	1.5	GN/BK	671	Power Window Motor Right Rear Down Control	I	AE3
4	1.5	GN/GY	1186	Power Window Switch Right Rear Up Signal	I	AE3
5	—	—	—	Not Occupied	—	-
6	1.5	BU/WH	1307	Power Window Master Switch Lockout Signal	I	AE3
7	—	—	—	Not Occupied	—	-
8	1.5	BN/BU	1188	Power Window Switch Right Rear Down Signal	I	AE3

S82 Windshield Wiper/Washer Switch



2215915

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: HCMDPB-08-S
Service Connector: 19301388
Description: 8-Way F 1.2 Series (WH)

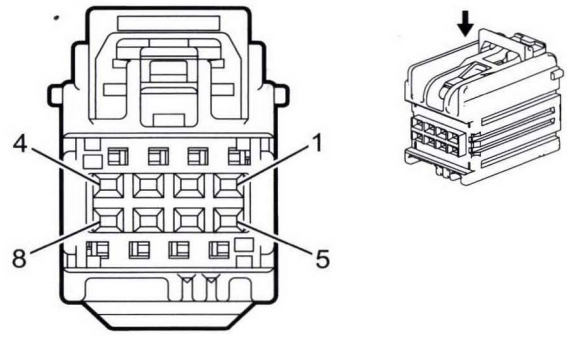
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-64B (L-BU)	Not Available	Not Available	Not Available	Not Available	Not Available

S82 Windshield Wiper/Washer Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	BK/GY	6009	Windshield Wiper Switch Low Reference	I	—
2	-	-	-	Not Occupied	-	-
3	0.35	YE/BU	1714	Windshield Wiper Switch Low Signal	I	—
4	0.35	GY	1715	Windshield Wiper Switch High Signal	I	—
5-6	-	-	-	Not Occupied	-	-
7	0.35	BN/BU	391	Rear Window Wiper Switch Signal	I	—
8	0.35	WH/BK	94	Windshield Washer Switch Signal	I	—

S83 Vehicle On/Off Switch (BTM)



1716517

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 7283-9028-30
Service Connector: 13576542
Description: 8-Way F YESC Kaizen Series (BK)

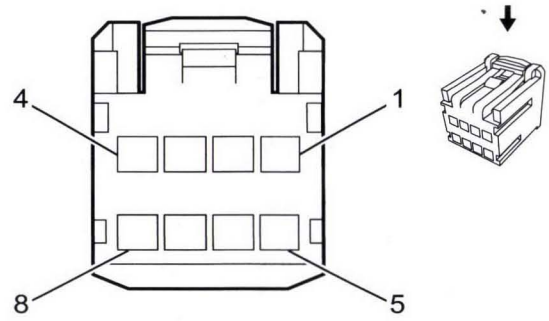
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-64B (L-BU)	Not Available	Not Available	Not Available	Not Available	Not Available

S83 Vehicle On/Off Switch (BTM)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	-	-	-	Not Occupied	-	-
2	0.35	BU/BK	5719	Ignition Mode Switch Start LED Signal	I	BTM
3	0.35	GN/BK	3558	Passive Start Switch Signal 2	I	BTM
4	0.35	BK	750	Ground	I	BTM
5	0.35	YE/GY	230	Instrument Panel Lamp Dimming Control	I	BTM
6	0.35	BU/GN	5723	Ignition Mode Switch Mode Voltage	I	BTM
7	0.35	BK/GY	3559	Passive Start Switch 2 Low Reference	I	BTM
8	-	-	-	Not Occupied	-	-

S91 Park Brake Control Switch



2180203

Connector Part Information

Harness Type: Body
OEM Connector: HCMDPB-08-K
Service Connector: 13576541
Description: 8-Way F 1.2 HCM Series (BK)

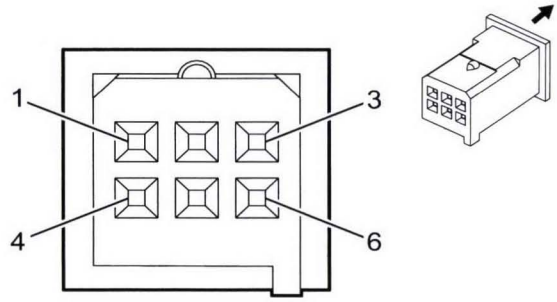
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

S91 Park Brake Control Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	YE	1492	Park Brake Switch Supply Voltage	I	—
2	0.35	BU/VT	1134	Park Brake Switch Signal	I	—
3	0.35	YE/RD	7683	Park Brake Release Switch Voltage Reference	I	—
4	0.35	BN	6107	Park Brake Apply Switch Signal	I	—
5	0.35	BU/BK	6108	Park Brake Release Switch Signal	I	—
6	0.35	YE	6817	LED Backlight Dimming Control	I	—
7	0.35	GY/RD	7684	Park Brake Apply Switch Voltage Reference	I	—
8	0.35	BK	1450	Ground	I	—

S126 Drive Mode Select Switch



1697500

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 1-968291-2
Service Connector: 88988105
Description: 6-Way F 0.64 Micro Quadlok Series (BK)

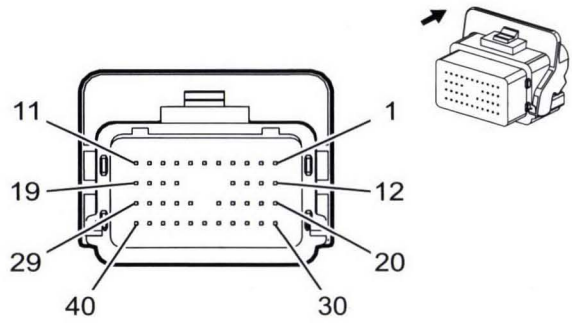
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

S126 Drive Mode Select Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	-
2	0.35	BK/VT	3109	Economy Mode Switch Low Reference	I	—
3	0.35	YE	6817	LED Backlight Dimming Control	I	—
4	0.35	BK	750	Ground	I	—
5 - 6	—	—	—	Not Occupied	—	—

T6 Power Inverter Module X1



2474745

Connector Part Information

Harness Type: Engine
OEM Connector: HPSPB-C40C21-BH
Service Connector: 19301389
Description: 40-Way F 0.64 Series, Sealed (GY)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575867	J-35616-64B (L-BU)	J-38125-215A	Not Available	Not Available	Not Available	Not Available
II	13575866	J-35616-64B (L-BU)	J-38125-215A	Not Available	Not Available	Not Available	Not Available

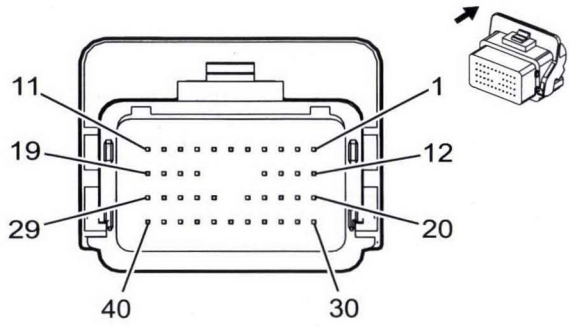
T6 Power Inverter Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	GN	3491	Traction Power Inverter Module Resolver #2 S2 Signal	I	–
2	0.75	BU/YE	3488	Traction Power Inverter Module Resolver #2 S1 Signal	I	–
3	0.75	BU	3486	Traction Power Inverter Module Resolver #2 Excitation Signal Positive	I	–
4	0.5	WH	6106	High Speed GMLAN Serial Data (-) (2)	II	–
5	0.5	WH	6106	High Speed GMLAN Serial Data (-) (2)	II	–
6	0.5	WH	6106	High Speed GMLAN Serial Data (-) (2)	II	–
7	0.5	BU/YE	6105	High Speed GMLAN Serial Data (+) (2)	II	–
8	0.5	WH	7494	High Speed GMLAN Serial Data (-)(3)	II	–
9	0.5	BU/BU	7493	High Speed GMLAN Serial Data (+)(3)	II	–
10	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	II	–
11	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	II	–
12	-	-	-	Not Occupied	-	-
13	0.75	GY	3487	Traction Power Inverter Module Resolver #2 S3 Signal	I	–
14	0.75 0.75	BN/YE WH/GN	3492 3485	Traction Power Inverter Module Resolver #2 S4 Signal Transmission Traction Power Inverter Module Resolver #2 Excitation Signal Negitive	I	– –

T6 Power Inverter Module X1 (cont'd)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
15	0.5	BU/YE	6105	High Speed GMLAN Serial Data (+) (2)	II	–
16	0.5	WH	7494	High Speed GMLAN Serial Data (-)(3)	II	–
17	0.5	BU/BU	7493	High Speed GMLAN Serial Data (+)(3)	II	–
18	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	II	–
19	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	II	–
20-23	-	-	-	Not Occupied	-	-
24	0.75	RD/VT	340	Battery Positive Voltage	I	–
25	0.5	BU/YE	6105	High Speed GMLAN Serial Data (+) (2)	II	–
26-40	-	-	-	Not Occupied	-	-

T6 Power Inverter Module X2



2474743

Connector Part Information

Harness Type: Engine
OEM Connector: HPSPB-C40C09-AK
Service Connector: 19301390
Description: 40-Way F 0.64 Series, Sealed (BK)

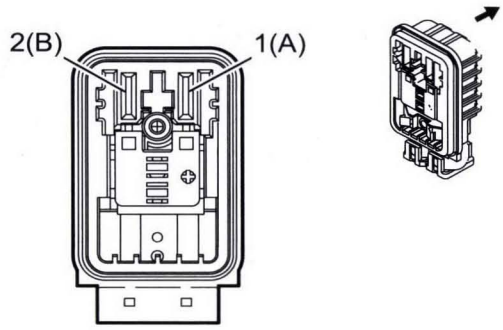
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575867	J-35616-64B (LT BU)	J-38125-215A	SAIT-A03T-M064	23	P	P
II	13575867	J-35616-64B (LT BU)	J-38125-215A	SAIT-A03T-M064	23	P	P

T6 Power Inverter Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 7	—	—	—	Not Occupied	—	-
8	0.75	VT	3493	Transmission IMS Mode Switch S bit Signal	I	—
9	0.75	BN	3496	Transmission IMS Mode Switch D1 bit Signal	I	—
10	0.75	YE/BK	3494	Transmission IMS Mode Switch R1 bit Signal	I	—
11	0.5	BU/WH	3977	Accessory Wakeup Serial Data 2	II	—
12 - 15	—	—	—	Not Occupied	—	-
16	0.75	BK/GY	3927	IMS Mode Switch Low Reference	I	—
17	0.75	GN/BN	3497	Transmission IMS Mode Switch D2 bit Signal	I	—
18	0.75	GY	3495	Transmission IMS Mode Switch R2 bit Signal	I	—
19	0.5	VT/BK	339	Run/Crank Ignition 1 Voltage	II	—
20 - 34	—	—	—	Not Occupied	—	-
35	0.5	RD/YE	240	Battery Positive Voltage	II	—
36 - 40	—	—	—	Not Occupied	—	—

T6 Power Inverter Module X3



3637819

Connector Part Information

Harness Type: Battery Cable
OEM Connector: 13933818
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F High Voltage Series, Sealed (GY)

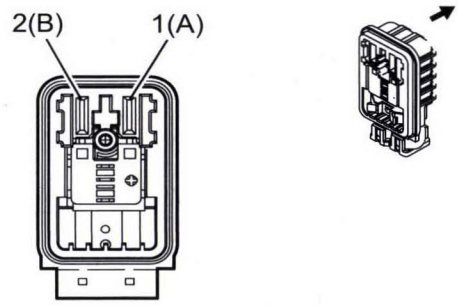
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

T6 Power Inverter Module X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	35	OG	3965	High Voltage Battery 3 (-)	I	—
B	35	OG	3966	High Voltage Battery 3 (+)	I	—

T6 Power Inverter Module X4



4074404

Connector Part Information

Harness Type: High Voltage
OEM Connector: 13937060
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F High Voltage Series, Sealed (GY)

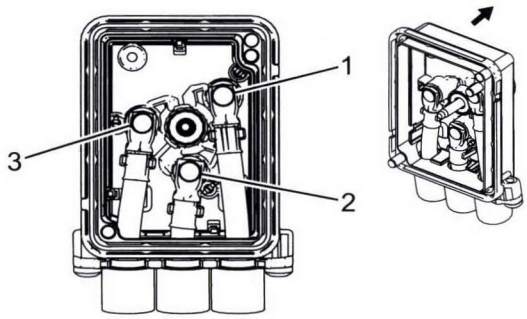
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

T6 Power Inverter Module X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	35	OG	3831	High Speed GMLAN Serial Data (+) (6)	I	—
B	35	OG	3832	High Speed GMLAN Serial Data (-) (6)	I	—

T6 Power Inverter Module X5



2553164

Connector Part Information

Harness Type: High Voltage
OEM Connector: Not Available
Service Connector: Service by Harness – See Part Catalog
Description: 3-Way

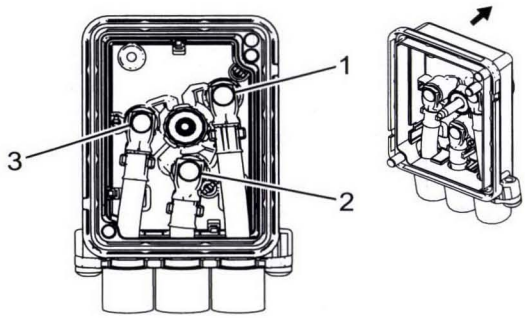
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	Not Available	Service by Harness – See Part Catalog	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

T6 Power Inverter Module X5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	35	OG	3770	Drive Motor 1 300V W Phase	I	—
2	35	OG	3771	Drive Motor 1 300V V Phase	I	—
3	35	OG	3772	Drive Motor 1 300V U Phase	I	—

T6 Power Inverter Module X6



2553164

Connector Part Information

Harness Type: High Voltage
OEM Connector: Not Available
Service Connector: Service by Harness – See Part Catalog
Description: 3-Way

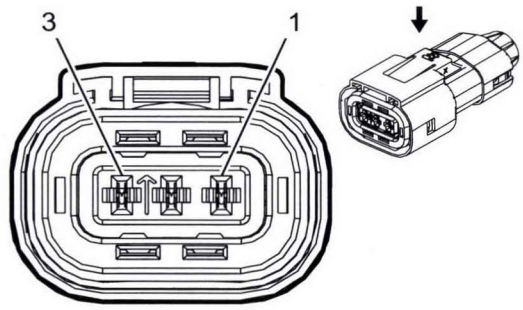
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	Not Available	Service by Harness – See Part Catalog	Not Available	Not Available	Not Available	Not Available

T6 Power Inverter Module X6

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	35	OG	3770	Drive Motor 2 300V W Phase	I	—
2	35	OG	3771	Drive Motor 2 300V V Phase	I	—
3	35	OG	3772	Drive Motor 2 300V U Phase	I	—

T6 Power Inverter Module X7



2553163

Connector Part Information

Harness Type: Auxiliary Transmission Fluid Pump
OEM Connector: Not Available
Service Connector: Service by Component – See Part Catalog
Description: 3-Way F (OG)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Component – See Part Catalog	J-35616-2A	Service by Component – See Part Catalog	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

T6 Power Inverter Module X7

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	35	OG	3770	Transmission Fluid Pump 300V W Phase	I	—
2	35	OG	3771	Transmission Fluid Pump 300V V Phase	I	—
3	35	OG	3772	Transmission Fluid Pump 300V U Phase	I	—

T6 Power Inverter Module X8

—

Connector Part Information

Harness Type: Battery Negative Cable
OEM Connector: CBR 512-012
Service Connector: Service by Component – See Part Catalog
Description: 1-Way Ring Terminal (NA)

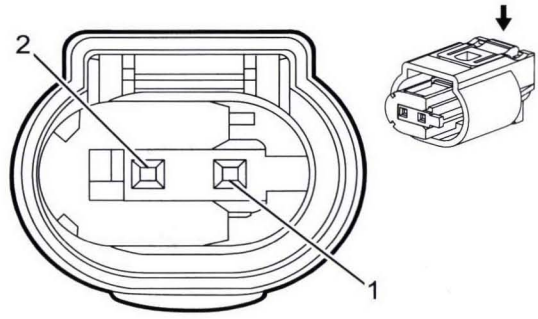
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Component – See Part Catalog	Not Available	Not Available	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

T6 Power Inverter Module X8

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	25	BK	750	Ground	I	—

T10J Keyless Entry Antenna - Center Console Front



1869767

Connector Part Information

Harness Type: Body
OEM Connector: 1-967644-1
Service Connector: 13576533
Description: 2-Way F 0.64 Micro-Quadlock Series, Sealed (BK with GN Terminal Position Assurance)

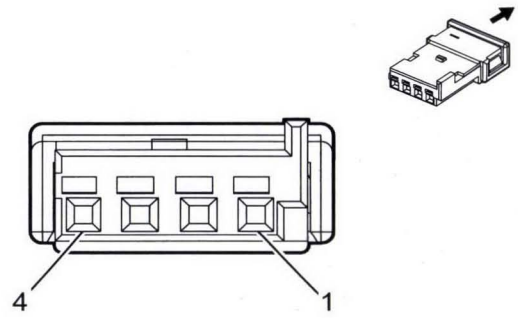
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

T10J Keyless Entry Antenna - Center Console Front

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BN/BK	3552	Passive Start Interior Antenna 1 Signal Hi	I	BTM
2	0.5	WH	3553	Passive Start Interior Antenna 1 Signal Lo	I	BTM

T10K Keyless Entry Antenna - Center Console Rear



2236821

Connector Part Information

Harness Type: Body
OEM Connector: 968943-2
Service Connector: 13576534
Description: 4-Way F 0.64 Micro-Quadlock Series (GY)

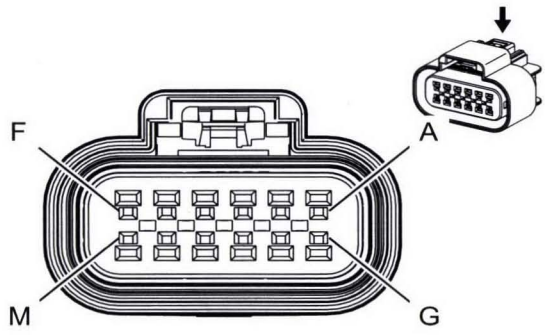
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

T10K Keyless Entry Antenna - Center Console Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BU	3554	Passive Start Interior Antenna 2 Signal Hi	I	BTM
2	0.5	GY/BK	3555	Passive Start Interior Antenna 2 Signal Lo	I	BTM
3 - 4	—	—	—	Not Occupied	—	—

T18 Battery Charger X1



2180214

Connector Part Information

Harness Type: Engine
OEM Connector: 13530777
Service Connector: 13504588
Description: 12-Way F 150 GT Series, Sealed (BK)

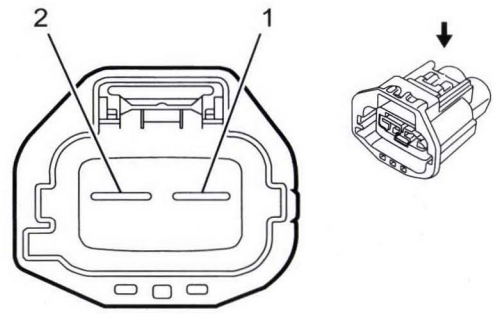
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575412	J-35616-14 (GN)	J-38125-553	12191819	9	E	1

T18 Battery Charger X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.5	VT/GY	139	Run/Crank Ignition 1 Voltage	I	—
B	0.5 0.5	BU/GN BU/GN	6433 6433	CAN Bus High Serial Data	I	CBT -CBT
C	0.5 0.5	WH WH	6432 6432	CAN Bus Low Serial Data	I	CBT -CBT
D - E	—	—	—	Not Occupied	—	-
F	0.5	BU/WH	3977	Accessory Wakeup Serial Data 2	I	—
G	0.5	BU/BN	3787	High Voltage Energy Management Communication Control	I	—
H	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
J	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
K	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
L	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
M	—	—	—	Not Occupied	—	—

T18 Battery Charger X2



811182

Connector Part Information

Harness Type: Engine
OEM Connector: 7283-5596-10
Service Connector: 88953307
Description: 2-Way F YESC USCAR Class III Series (D-GY)

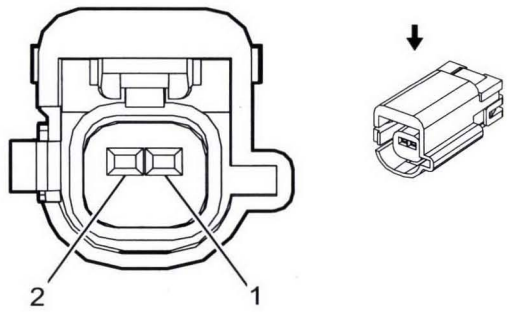
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-42 (RD)	Not Required	Not Required	Not Required	Not Required	Not Required

T18 Battery Charger X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	3	BK	1350	Ground	I	—
2	3	RD/WH	640	Battery Positive Voltage	I	—

T18 Battery Charger X3



2474760

Connector Part Information

Harness Type: Engine
OEM Connector: 13738744
Service Connector: 13577521
Description: 2-Way F 1.2 Micro HVT Series, Sealed (GY)

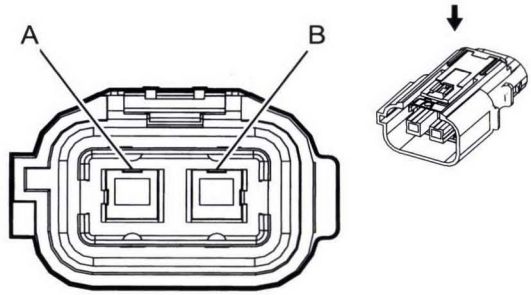
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

T18 Battery Charger X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GY/VT	5595	High Voltage Interlock Loop Signal (2)	I	—
2	0.5	BK/VT	5596	High Voltage Interlock Loop Low Reference (2)	I	—

T18 Battery Charger X4



2474683

Connector Part Information

Harness Type: High Voltage
OEM Connector: 13861585
Service Connector: Service by Harness – See Part Catalog
Description: 2-Way F (OG)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Harness – See Part Catalog	Service by Harness – See Part Catalog	Service by Harness – See Part Catalog	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

T18 Battery Charger X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	2	OG	3834	High Voltage Battery (+)	I	—
B	2	OG/BK	5083	High Voltage Battery (-)	I	—

T18 Battery Charger X5

—

Connector Part Information

Harness Type: Engine
OEM Connector: 15354757
Service Connector: Service by Cable Assembly - See Part Catalog
Description: 1-Way Ring Terminal (NA)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	No Tool Required	No Tool Required	Not Required	Not Required	Not Required	Not Required

T18 Battery Charger X5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	5	BK	1350	Ground	I	—

T18 Battery Charger X6

—

Connector Part Information

Harness Type: Engine
OEM Connector: ST711074-3
Service Connector: Service by Cable Assembly - See Part Catalog
Description: 1-Way Ring Terminal (NA)

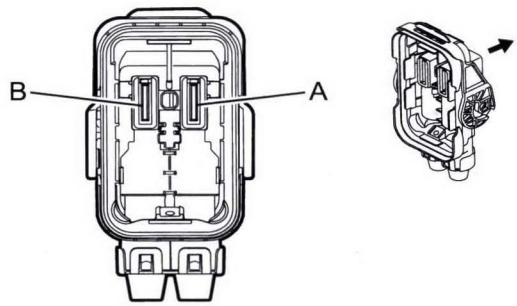
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	No Tool Required	No Tool Required	Not Required	Not Required	Not Required	Not Required

T18 Battery Charger X6

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	5	BK	1350	Ground	I	—

T24 Battery Charger - DC X1



4074318

Connector Part Information

Harness Type: High Voltage
OEM Connector: 13862892
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F Power Pack 2000 (OG)

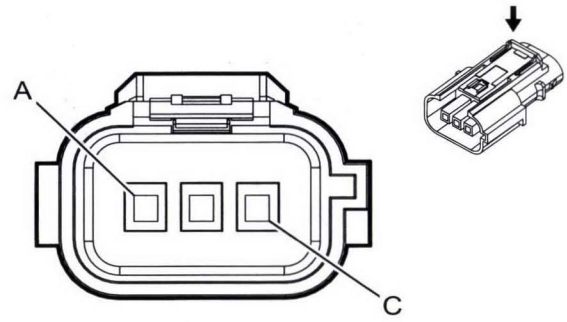
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

T24 Battery Charger - DC X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	35	OG	3831	High Voltage (+)	I	—
B	35	OG/BK	3832	High Voltage (-)	I	—

T24 Battery Charger - DC X2 (CBT)



3420259

Connector Part Information

Harness Type: Battery Charger Receptacle
OEM Connector: 13861587
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 3-Way F 150 Metri-Pack Series (OG)

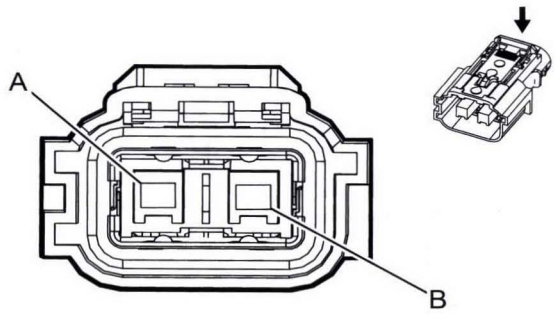
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

T24 Battery Charger - DC X2 (CBT)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	3	BK	3837	Voltage AC Line 1	I	—
B	3	D-GN	3952	Voltage AC Ground	I	—
C	3	WH	3838	Voltage AC Neutral Line 2	I	—

T24 Battery Charger - DC X3



3818808

Connector Part Information

Harness Type: High Voltage
OEM Connector: 13824784
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 280 Metri-Pack Series, Sealed (OG)

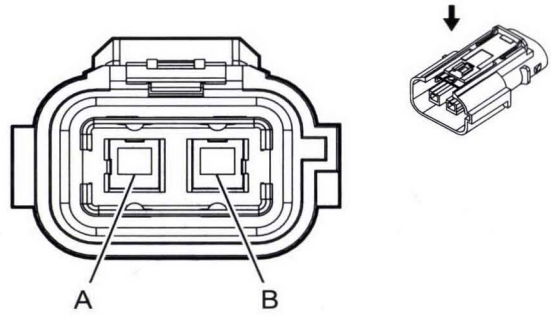
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-35 (VT)	No Tool Required	Not Required	Not Required	Not Required	Not Required

T24 Battery Charger - DC X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	3	OG	5084	High Voltage Battery (+)	I	—
B	3	OG	5083	High Voltage Battery (-)	I	—

T24 Battery Charger - DC X4



2891114

Connector Part Information

Harness Type: Battery Cable
OEM Connector: 13861584
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 280 Metri-Pack Series, Sealed

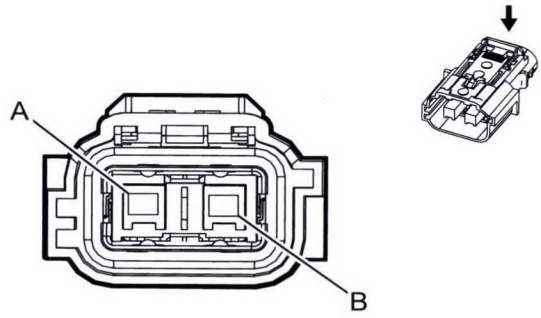
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

T24 Battery Charger - DC X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	5	OG	3970	High Voltage Battery 4 (+)	I	—
B	5	OG	3969	High Voltage Battery 4 (-)	I	—

T24 Battery Charger - DC X5



3818813

Connector Part Information

Harness Type: High Voltage
OEM Connector: 13830160
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 280 Metri-Pack Series, Sealed (OG)

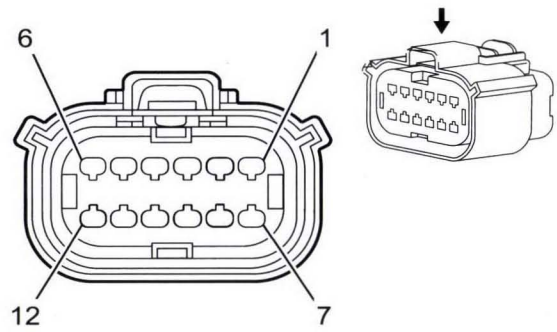
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-35 (VT)	No Tool Required	Not Required	Not Required	Not Required	Not Required

T24 Battery Charger - DC X5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	5	OG	3974	High Voltage Battery 5 (+)	I	—
B	5	OG	3973	High Voltage Battery 5 (-)	I	—

T24 Battery Charger - DC X6



1825165

Connector Part Information

Harness Type: Engine
OEM Connector: 33472-1201
Service Connector: 13503528
Description: 12-Way F 150 MX Series, Sealed (BK)

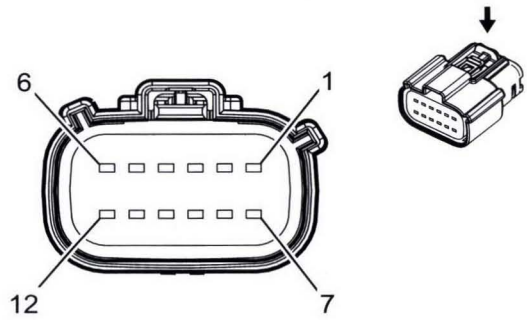
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575868	J-35616-2A (GY)	J-38125-217	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

T24 Battery Charger - DC X6

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BK	2050	Ground	I	CBT
2	0.5	GN/OG	3093	High Voltage Battery Cutoff Module Low Control	I	CBT
3	0.5	BK	2050	Ground	I	CBT
4	0.5	OG/BU	3092	High Voltage Battery Cutoff Module High Control	I	CBT
5 - 6	—	—	—	Not Occupied	—	-
7	0.5	RD/BN	2940	Battery Positive Voltage	I	CBT
8	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	CBT
9	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	CBT
10	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	CBT
11	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	CBT
12	0.5	WH/BU	5986	Serial Data Communication Enable	I	CBT

T24 Battery Charger - DC X7



2871866

Connector Part Information

Harness Type: Engine
OEM Connector: 33472-1253
Service Connector: 19301379
Description: 12-Way F 150 MX Series, Sealed (D-GY)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575868	J-35616-2A (GY)	J-38125-217	Not Available	Not Available	Not Available	Not Available

T24 Battery Charger - DC X7

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	BU/BN	3787	High Voltage Energy Management Communication Control	I	CBT
2	0.5	WH	6432	CAN Bus Low Serial Data	I	CBT
3	0.5	WH	6432	CAN Bus Low Serial Data	I	CBT
4	0.5	BU/GN	6433	CAN Bus High Serial Data	I	CBT
5	0.5	BU/GN	6433	CAN Bus High Serial Data	I	CBT
6	0.5	GN/VT	5092	Module Low Signal	I	CBT
7	0.5	WH	5093	Module High Signal	I	CBT
8	0.5	GY/GN	3954	Control Pilot Signal 1	I	CBT
9	—	—	—	Not Occupied	—	-
10	0.5	VT/RD	2965	High Voltage Battery Current Sensor Voltage Reference	I	CBT
11	0.5	OG	7639	High Voltage Battery Pack Traction Power Inverter Module Positive Control	I	CBT
12	0.5	OG/BK	7644	High Voltage Battery Pack Traction Power Inverter Module Negative Control	I	CBT

T24 Battery Charger - DC X8

—

Connector Part Information

Harness Type: Battery Negative Cable
OEM Connector: CBR 512-012
Service Connector: Service by Component – See Part Catalog
Description: 1-Way Ring Terminal (NA)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Service by Component – See Part Catalog	Not Available	Not Available	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

T24 Battery Charger - DC X8

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	25	BK	750	Ground	I	—

T24 Battery Charger - DC X9

—

Connector Part Information

Harness Type: Battery Cable
OEM Connector: CPTBR56-012
Service Connector: Service by Cable Assembly - See Part Catalog
Description: 1-Way Ring Terminal (NA)

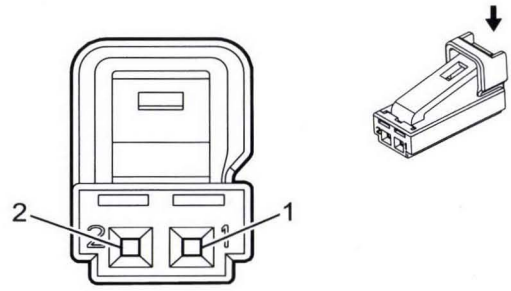
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	No Tool Required	No Tool Required	Not Required	Not Required	Not Required	Not Required

T24 Battery Charger - DC X9

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	25	BK	750	Ground	I	—

X21 Manual Service Disconnect Receptacle X3



4073789

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 10865735
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 0.64 MQS Series (BK)

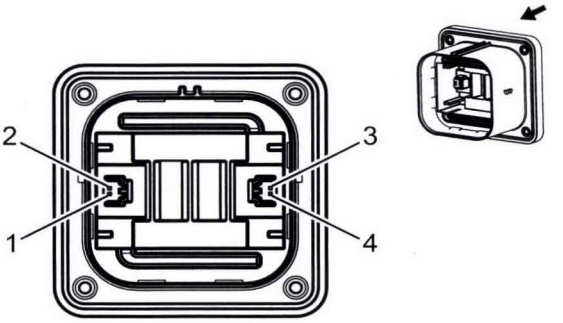
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-64B (LT BU)	Not Available	Not Available	Not Available	Not Available	Not Available

X21 Manual Service Disconnect Receptacle X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	VT	5087	High Voltage Interlock Loop Signal (1)	I	—
2	0.5	BK/BN	5088	High Voltage Interlock Loop Low Reference (1)	I	—

X21 Manual Service Disconnect Receptacle X5



4217358

Connector Part Information

Harness Type: Manual Service Disconnect Receptacle
OEM Connector: 1–1587987–1
Service Connector: Service by Harness — See Part Catalog
Description: 4-Way F Receptacle Assembly (OG)

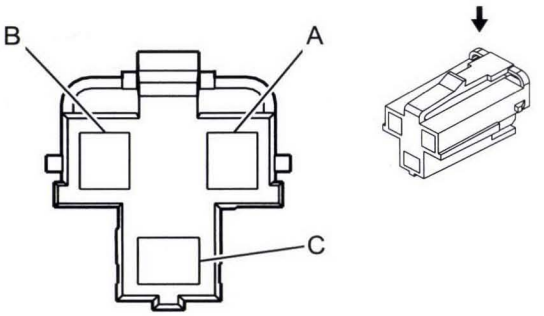
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-64B (LT BU)	Not Available	Not Available	Not Available	Not Available	Not Available

X21 Manual Service Disconnect Receptacle X5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	High Voltage Interlock Loop Low Reference (1)	I	—
2	—	—	—	High Voltage Interlock Loop Signal (1)	I	—
3–4	—	—	—	Not Occupied	—	–

X80G Accessory Power Receptacle - Instrument Panel



362748

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 12176836
Service Connector: 19257374
Description: 3-Way F 280 Metri-Pack Series (GY)

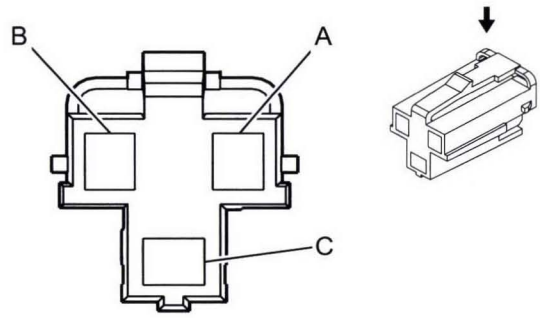
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-4A (PU)	Not Required	Not Required	Not Required	Not Required	Not Required

X80G Accessory Power Receptacle - Instrument Panel

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	1	VT	801	Retained Accessory Power Fuse Control	I	—
B	1	BK	1050	Ground	I	—
C	—	—	—	Not Occupied	—	—

X80H Accessory Power Receptacle - Center Console



362748

Connector Part Information

Harness Type: Body
OEM Connector: 12176836
Service Connector: 19257374
Description: 3-Way F 280 Metri-Pack Series (GY)

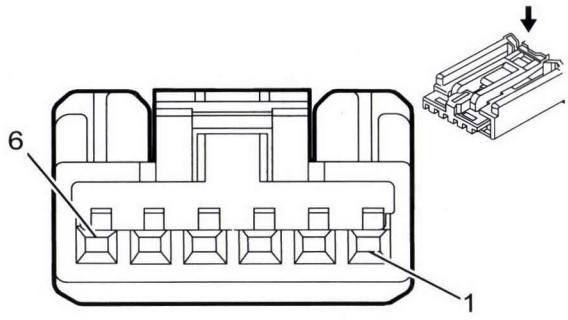
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-4A (PU)	Not Required	Not Required	Not Required	Not Required	Not Required

X80H Accessory Power Receptacle - Center Console

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	1	VT	2101	Retained Accessory Power Fuse Ignition	I	—
B	1	BK	750	Ground	I	—
C	—	—	—	Not Occupied	—	—

X83 Auxiliary Audio Input



1862240

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: AIT2PB-06-1AK
Service Connector: 19167753
Description: 6-Way F 0.64 Kaizen Series (BK)

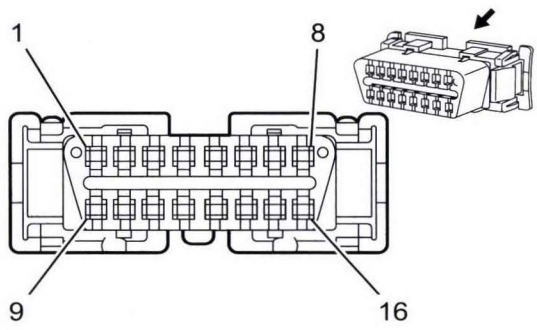
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

X83 Auxiliary Audio Input

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GY	5839	Left Auxiliary Audio Signal (2)	I	—
2	0.35	GN	5841	Right Auxiliary Audio Signal (2)	I	—
3	0.35	VT	5843	Auxiliary Audio Common Signal	I	—
4	0.5	BK/WH	751	Signal Ground	I	—
5	0.35	BU	2060	Auxiliary Detection Signal	I	—
6	0.35	BU	3373	Auxiliary Video High Signal (2)	I	—

X84 Data Link Connector



1962076

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 51115-1621
Service Connector: 13584381
Description: 16-Way F 51115 Series (BK)

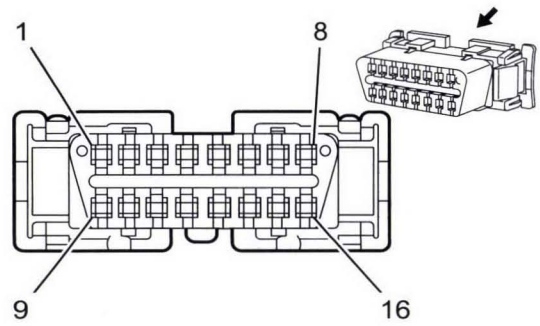
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575534	J-35616-2A (GY)	J-38125-12A	50420-8000	24	H	H

X84 Data Link Connector

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	GN	5060	Low Speed GMLAN Serial Data	I	—
2 - 3	—	—	—	Not Occupied	—	-
4	0.5	BK	750	Ground	I	—
5	0.5	BK	750	Ground	I	—
6	0.5	BU	2500	High Speed GMLAN Serial Data (+) (1)	I	—
7 - 11	—	—	—	Not Occupied	—	-
12	0.5	BU/YE	6105	High Speed GMLAN Serial Data (+) (2)	I	—
13	0.5	WH	6106	High Speed GMLAN Serial Data (-) (2)	I	—
14	0.5	WH	2501	High Speed GMLAN Serial Data (-) (1)	I	—
15	—	—	—	Not Occupied	—	-
16	0.5	RD/BN	2240	Battery Positive Voltage	I	—

X84A Auxillary Data Link Connector



1962076

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 51115-1621
Service Connector: 13584381
Description: 16-Way F 51115 Series (BK)

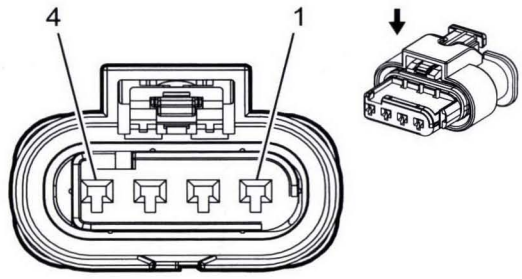
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575534	J-35616-2A (GY)	J-38125-12A	50420-8000	24	H	H

X84A Auxillary Data Link Connector

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	-
3	0.5	BU/GN	6433	CAN Bus High Serial Data	I	—
4	0.5	BK	1450	Ground	I	—
5	0.5	BK	1450	Ground	I	—
6 - 7	—	—	—	Not Occupied	—	-
8	0.5	BK	1450	Ground	I	—
9 - 10	—	—	—	Not Occupied	—	-
11	0.5	WH	6432	CAN Bus Low Serial Data	I	—
12	0.5	BU/BK	7493	High Speed GMLAN Serial Data (+)(3)	I	—
13	0.5	WH	7494	High Speed GMLAN Serial Data (-)(3)	I	—
14 - 15	—	—	—	Not Occupied	—	-
16	0.5	RD/BN	2240	Battery Positive Voltage	I	—

X85 Steering Wheel Air Bag Coil X1



2684560

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 1-2141402-4
Service Connector: 13586137
Description: 4-Way F 1.2 Series, Sealed (YE)

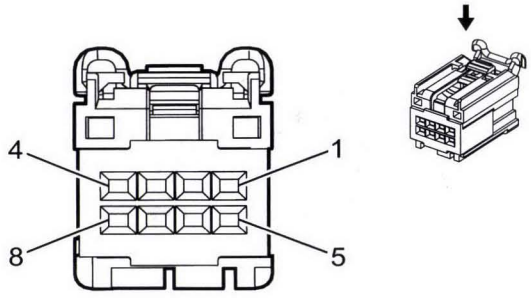
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-16 (LT GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required

X85 Steering Wheel Air Bag Coil X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.5	OG/VT	3021	Steering Wheel Module Stage 1 High Control	I	AYF/AW7
2	0.5	BN/OG	3020	Steering Wheel Module Stage 1 Low Control	I	AYF/AW7
3	0.5	OG/GN	3023	Steering Wheel Module Stage 2 High Control	I	AYF/AW7
4	0.5	WH/OG	3022	Steering Wheel Module Stage 2 Low Control	I	AYF/AW7

X85 Steering Wheel Air Bag Coil X2



2913663

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 1456987-4
Service Connector: 19329948
Description: 8-Way F GET Series (BK)

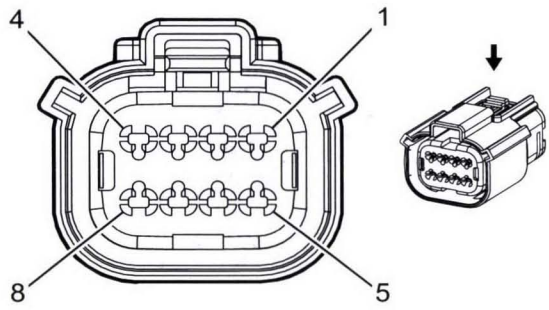
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

X85 Steering Wheel Air Bag Coil X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.35	GN/WH	3287	Horn Switch Signal	I	UC3+K34+(EF7/ Z49)
2	0.35	WH/RD	1444	12 Volt Reference	I	UC3+K34+(EF7/ Z49)
3	0.35	BN/GN	1884	Cruise Control Set/Coast/Resume/Accelerate Switch Signal	I	UC3+K34+(EF7/ Z49)
4	0.35	YE	6817	LED Backlight Dimming Control	I	UC3+K34+(EF7/ Z49)
5	0.35	WH/RD	1444	12 Volt Reference	I	UC3+K34+(EF7/ Z49)
6	0.35	GN/WH	6819	Steering Wheel Resistor Ladder Signal 2	I	UC3+K34+(EF7/ Z49)
7	0.35	YE	6817	LED Backlight Dimming Control	I	UC3+K34+(EF7/ Z49)
8	0.35	BK	750	Ground	I	UC3+K34+(EF7/ Z49)

X98 Hybrid/EV Battery Charger Receptacle



2268728

Connector Part Information

Harness Type: Battery Charger Receptacle
OEM Connector: 15456954
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 8-Way F 150 MX Series, Sealed (BK)

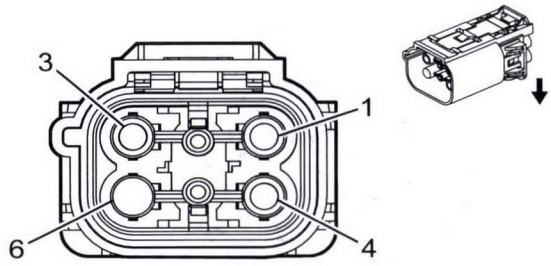
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-2A (GY)	No Tool Required	Not Required	Not Required	Not Required	Not Required

X98 Hybrid/EV Battery Charger Receptacle

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	WH/GY	5239	Inside Rear View Mirror Vertical Potentiometer	I	—
2	0.75	YE/GY	5241	Inside Rear View Mirror Horizontal Potentiometer	I	—
3	0.75	D-GN/VT	5243	Inside Rear View Mirror Potentiometer Ground	I	—
4	0.75	VT/BN	3699	Charge Port Door Switch Signal	I	—
5	0.75	GY/D-BU	213	Charge Port Paddle Temperature Sensor Signal	I	—
6	0.75	BK/D-BU	5404	Charge Port Paddle Temperature Sensor Low Reference	I	—
7	0.75	BN/YE	2231	Charge Port Valve Motor Close Control	I	—
8	0.75	D-BU/WH	2230	Charge Port Valve Motor Open Control	I	—

X98A Hybrid/EV Battery Charger Receptacle - AC



4073910

Connector Part Information

Harness Type: Battery Charger Receptacle
OEM Connector: 13879050
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 6-Way F 1.0, 2.4 HES Sealed (OG)

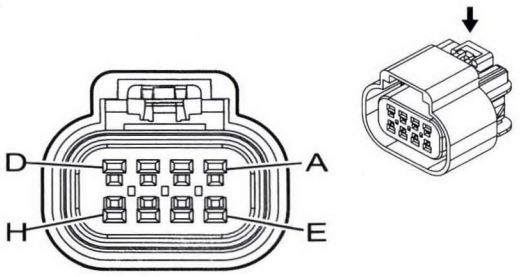
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required

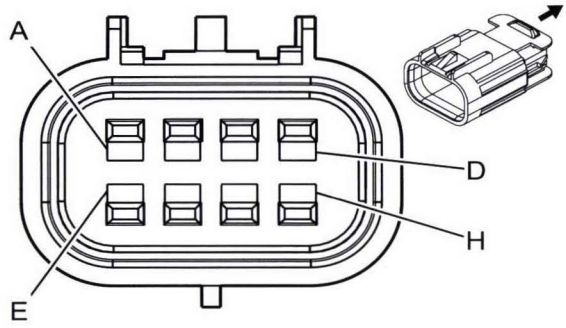
X98A Hybrid/EV Battery Charger Receptacle - AC

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	3	D-GN	3952	Voltage AC Ground	II	—
2	0.75	GY/BN	3954	Control Pilot Signal 1	I	—
3	3	BK	3837	Voltage AC Line 1	II	—
4	3	WH	3838	Voltage AC Neutral Line 2	II	—
5	0.75	D-BU/YE	3953	Proximity Status Signal 1	I	—
6	—	—	—	Not Occupied	—	—

Inline Harness Connector End Views
X100 Body Harness to Engine Harness



646400



684916

Connector Part Information

Harness Type: Engine
OEM Connector: 15326835
Service Connector: 13580112
Description: 8-Way F 150 GT Series, Sealed (BK)

Connector Part Information

Harness Type: Body
OEM Connector: 15326840
Service Connector: 13587152
Description: 8-Way M 150 GT Series, Sealed (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-3 (GY)	Not Required	Not Required	Not Required	Not Required	Not Required

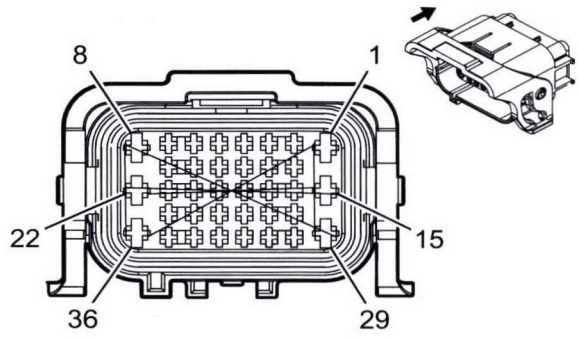
X100 Body Harness to Engine Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
A	—	—	—	—	—	Not Occupied	A	—	—	—	—	—
B	0.5	BK/ BN	5088	I	—	High Voltage Interlock Loop Low Reference (1)	B	0.5	BK/ BN	5088	II	—
C - D	—	—	—	—	—	Not Occupied	C - D	—	—	—	—	—
E	0.5	OG	7639	I	CBT	High Voltage Battery Pack Traction Power Inverter Module Positive Control	E	0.5	OG	7639	II	CBT
F	0.5	OG/ BK	7644	I	CBT	High Voltage Battery Pack Traction Power Inverter Module Negative Control	F	0.5	OG/ BK	7644	II	CBT

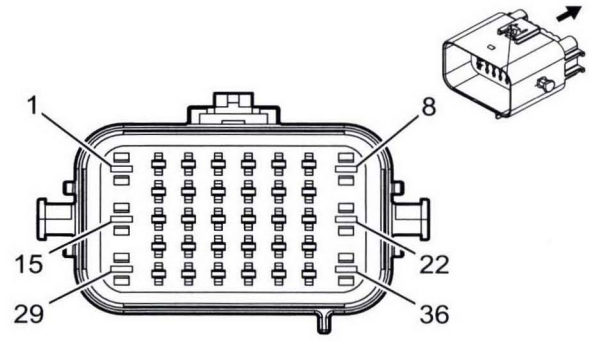
X100 Body Harness to Engine Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
G	0.5	GN/ VT	5092	I	CBT	Module Low Signal	G	0.5	GN/ VT	5092	II	CBT
H	0.5	WH	5093	I	CBT	Module High Signal	H	0.5	WH	5093	II	CBT

X105 Body Harness to Engine Harness



1869605



1869606

Connector Part Information

Harness Type: Body

OEM Connector: 1743059-2

Service Connector: 13580088

Description: 36-Way F Micro Timer II/Junior Power Timer Series (BK)

Connector Part Information

Harness Type: Engine

OEM Connector: 1743062-2

Service Connector: 13580089

Description: 36-Way M Micro Timer II/Junior Power Timer Hybrid Series, Sealed (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	19301414	J-35616-35 (VT)	J-38125-36	4-964286-1	4	E	1
II	13576368	J-35616-14 (GN)	J-38125-560	4-969005-1	5	E	1
III	13581377	J-35616-14 (GN)	J-38125-560	964274-2	3	E	1
IV	13575350	J-35616-5 (PU)	J-38125-36	1-962915-3	8	E	1
V	13575350	J-35616-5 (PU)	J-38125-36	1-962915-3	8	E	1
VI	13581378	J-35616-34 (YE)	J-38125-560	964265-2	24	E	2

X105 Body Harness to Engine Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	—	—	—	—	—	Not Occupied	1	—	—	—	—	—
2	0.5	BK/ BN	5088	II	—	High Voltage Interlock Loop Low Reference (1)	2	0.5	BK/ BN	5088	VI	—
3	0.5	VT/ GY	709	II	—	Left Park Lamp Control	3	0.5	VT/ GY	709	VI	—
4	0.5	BU/ BN	3787	II	—	High Voltage Energy Management Communica- tion Control	4	0.5	BU/ BN	3787	VI	—

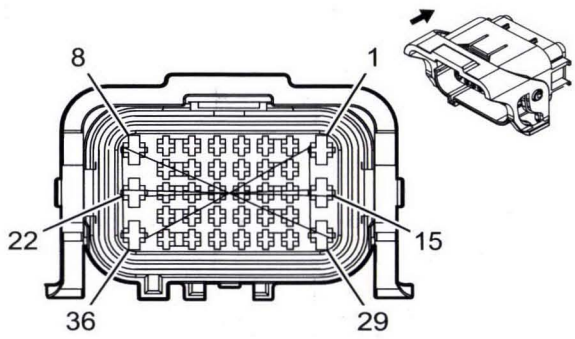
X105 Body Harness to Engine Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
5	0.35	WH/BU	6311	II	—	Cruise/ETC/TCC Brake Signal	5	0.5	WH/BU	6311	VI	—
6	0.5	BU/WH	1314	II	DLS	Left Front Turn Signal Lamp Control	6	0.5	BU/WH	1314	VI	—
7	0.5	GN	5060	II	—	Low Speed GMLAN Serial Data	7	0.5	GN	5060	VI	—
8	0.75	BU/WH	1314	III	D71	Left Front Turn Signal Lamp Control	8	0.75	BU/WH	1314	V	—
9	0.35	BU/RD	3335	II	—	Brake Pedal Travel Sensor 1 High Reference	9	0.5	BU/RD	3335	VI	—
10	0.35	BK/GY	3417	II	—	Brake Pedal Travel Sensor 1 Low Reference	10	0.5	BK/GY	3417	VI	—
11	0.35	BU/YE	3334	II	—	Brake Pedal Travel Sensor 1 Signal	11	0.5	BU/YE	3334	VI	—
12	0.35	VT/BN	3333	II	—	Brake Pedal Travel Sensor 2 Signal	12	0.5	VT/BN	3333	VI	—
13	0.35	BU/VT	5076	II	—	Current Sensor Control	13	0.5	BU/VT	5076	VI	—
14	0.35	BK/VT	5077	II	—	Current Sensor Low Reference	14	0.5	BK/VT	5077	VI	—
15	0.5	GN/GY	3853	I	—	Cabin Heater Coolant Motor Control	15	0.5	GN/GY	3853	IV	—
16	0.35	WH/YE	5075	II	—	Current Sensor Signal	16	0.5	WH/YE	5075	VI	—
17	0.5	BU	884	II	—	Wheel Speed Sensor Signal Left Rear	17	0.5	BU	884	VI	—
18	0.5	BK/BU	885	II	—	Wheel Speed Sensor Low Reference Left Rear	18	0.5	BK/BU	885	VI	—
19	0.5	VT	882	II	—	Wheel Speed Sensor Signal Right Rear	19	0.5	VT	882	VI	—
20	0.5	BK/VT	883	II	—	Wheel Speed Sensor Low Reference Right Rear	20	0.5	BK/VT	883	VI	—

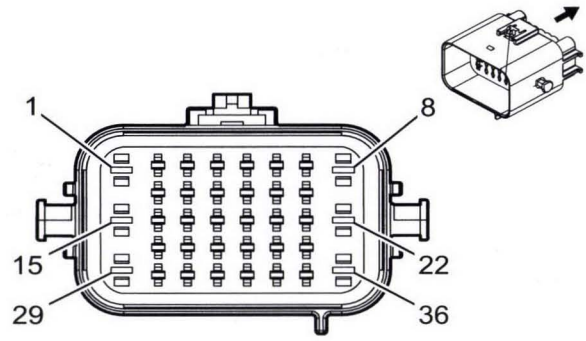
X105 Body Harness to Engine Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
21	0.5	BU/WH	3977	II	—	Accessory Wakeup Serial Data 2	21	0.5	BU/WH	3977	VI	—
22	—	—	—	—	—	Not Occupied	22	—	—	—	—	—
23	0.5	BU	2500	II	—	High Speed GMLAN Serial Data (+) (1)	23	0.5	BU	2500	VI	—
24	0.5	WH	2501	II	—	High Speed GMLAN Serial Data (-) (1)	24	0.5	WH	2501	VI	—
25	0.5	BK/BU	1271	II	—	Accelerator Pedal Position Low Reference (1)	25	0.5	BK/BU	1271	VI	—
26	0.5	YE/WH	1161	II	—	Accelerator Pedal Position Signal (1)	26	0.5	YE/WH	1161	VI	—
27	0.5	WH/RD	1164	II	—	Accelerator Pedal Position 5 Volt Reference (1)	27	0.5	WH/RD	1164	VI	—
28	0.5	BK/VT	1272	II	—	Accelerator Pedal Position Low Reference (2)	28	0.5	BK/VT	1272	VI	—
29	0.5	VT/YE	3854	I	—	Cabin Heater Coolant Motor Control	29	0.5	VT/YE	3854	IV	—
30	0.5	GN/WH	1162	II	—	Accelerator Pedal Position Signal (2)	30	0.5	GN/WH	1162	VI	—
31	0.5	BN/RD	1274	II	—	Accelerator Pedal Position 5 Volt Reference (2)	31	0.5	BN/RD	1274	VI	—
32	—	—	—	—	—	Not Occupied	32	—	—	—	—	—
33	0.5	BN/BU	3852	II	—	Cabin Heater Coolant Motor Feedback Signal	33	0.5	BN/BU	3852	VI	—
34	0.5	BU/YE	6105	II	—	High Speed GMLAN Serial Data (+) (2)	34	0.5	BU/YE	6105	VI	—
35	0.5	WH	6106	II	—	High Speed GMLAN Serial Data (-) (2)	35	0.5	WH	6106	VI	—
36	—	—	—	—	—	Not Occupied	36	-	—	—	—	—

X106 Body Harness to Forward Lamp Harness



1869605



1869606

Connector Part Information

Harness Type: Body

OEM Connector: 1743059-2

Service Connector: 13580088

Description: 36-Way F Micro Timer II/Junior Power Timer Series (BK)

Connector Part Information

Harness Type: Forward Lamp

OEM Connector: 1743062-2

Service Connector: 13580089

Description: 36-Way M Micro Timer II/Junior Power Timer Hybrid Series, Sealed (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	19301414	J-35616-35 (VT)	J-38125-36	4-964286-1	4	E	1
II	13575362	J-35616-35 (VT)	J-38125-36	4-964286-1	4	E	1
III	19301414	J-35616-35 (VT)	J-38125-36	4-964286-1	4	E	1
IV	19301414	J-35616-35 (VT)	J-38125-36	4-964286-1	4	E	1
IX	13578827	J-35616-5 (PU)	J-38125-36	Not Available	Not Available	Not Available	Not Available
V	13576368	J-35616-14 (GN)	J-38125-560	4-969005-1	5	E	1
VI	13581377	J-35616-14 (GN)	J-38125-560	964274-2	3	E	1
VII	13578827	J-35616-5 (PU)	J-38125-36	Not Available	Not Available	Not Available	Not Available
VIII	13575350	J-35616-5 (PU)	J-38125-36	1-962915-3	8	E	1
X	13578827	J-35616-5 (PU)	J-38125-36	Not Available	Not Available	Not Available	Not Available
X	13578827	J-35616-5 (PU)	J-38125-36	Not Available	Not Available	Not Available	Not Available
XI	13578827	J-35616-5 (PU)	J-38125-36	Not Available	Not Available	Not Available	Not Available
XII	13581378	J-35616-34 (YE)	J-38125-560	964265-2	24	E	2

X106 Body Harness to Forward Lamp Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	BK	750	IV	—	Ground	1	0.5	BK	750	XI	—
2	0.35	WH	2368	V	—	Cooling Fan Control Signal	2	0.5	WH	2368	XII	—
3	0.5	OG/ YE	354	V	D90	Left Front Discrimi-nating Sensor Signal	3	0.5	OG/ YE	354	XII	D9O+(AYF/ AW7)
4	0.5	BK/ OG	5045	V	D90	Left Front Discrimi-nating Sensor Low Reference	4	0.5	BK/ OG	5045	XII	D9O+(AYF/ AW7)
5	—	—	—	—	—	Not Occupied	5	—	—	—	—	—
6	0.35	BU/ GY	636	V	—	Outside Ambient Air Temperature Sensor Signal	6	0.5	BU/ GY	636	XII	—
7	0.35	BK/ BU	61	V	—	Outside Ambient Temperature Sensor Low Reference	7	0.5	BK/ BU	61	XII	—
8	—	—	—	—	—	Not Occupied	8	—	—	—	—	—
9	0.5	BN/ YE	189	V	TR6	Headlamp Leveling Motor Control	9	0.5	BN/ YE	189	XII	TR6
10	0.5	OG/ GN	1409	V	D90 +(AYF/ AW7)	Right Front Discrimi-nating Sensor Signal	10	0.5	OG/ GN	1409	XII	D9O+(AYF/ AW7)
11	0.5	BK/ OG	5600	V	D90 +(AYF/ AW7)	Right Front Discrimi-nating Sensor Low Reference	11	0.5	BK/ OG	5600	XII	D9O+(AYF/ AW7)
12	—	—	—	—	—	Not Occupied	12	—	—	—	—	—
13	0.75	GN/ VT	1315	VI	—	Right Front Turn Signal Lamp Control	13	0.75	GN/ VT	1315	VII	—
14	—	—	—	—	—	Not Occupied	14	—	—	—	—	—
15	2	WH	92	I	—	Windshield Wiper Motor High Speed Control	15	2	WH	92	X	RHD
16	0.5	GY/ GN	309	III	—	Right Park Lamp Control	16	0.5	GY/ GN	309	IX	—
17	0.35	BK/ YE	407	V	—	Sensor Low Reference	17	0.5	BK/ YE	407	XII	—

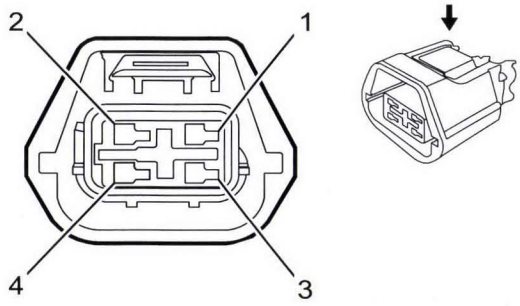
X106 Body Harness to Forward Lamp Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
18	0.35	GN/VT	2032	V	—	Coolant Temperature Sensor Signal	18	0.5	GN/VT	2032	XII	—
19	—	—	—	—	—	Not Occupied	19	—	—	—	—	—
20	0.5	VT/WH	1159	V	—	External Speaker Signal (+)	20	0.5	VT/WH	1159	XII	—
21	0.5	GY/BK	1160	V	—	External Speaker Signal (-)	21	0.5	GY/BK	1160	XII	—
22	2	YE/BN	95	I	—	Windshield Wiper Motor Low Speed Control	22	2	YE/BN	95	X	RHD
23	0.5	BU/YE	3953	V	—	Proximity Status Signal 1	23	0.5	BU/YE	3953	XII	—
24	0.5	GY/GN	3954	V	—	Control Pilot Signal 1	24	0.5	GY/GN	3954	XII	CBT
25	0.5	WH/GY	5239	V	CBT	Inside Rear View Mirror Vertical Potentiom-eter	25	0.5	WH/GY	5239	XII	CBT
26	0.5	YE/GY	5241	V	CBT	Inside Rear View Mirror Horizontal Potentiom-eter	26	0.5	YE/GY	5241	XII	CBT
27	0.5	GN/VT	5243	V	CBT	Inside Rear View Mirror Potentiom-eter Ground	27	0.5	GN/VT	5243	XII	CBT
28	0.5	VT/BN	3699	V	CBT	Charge Port Door Switch Signal	28	0.5	VT/BN	3699	XII	CBT
29	2	BK	750	I	—	Ground	29	2	BK	750	X	RHD
30	0.5	GY/BU	213	V	CBT	Charge Port Paddle Temperature Sensor Signal	30	0.5	GY/BU	213	XII	CBT
31	0.5	BK/BU	5404	V	CBT	Charge Port Paddle Temperature Sensor Low Reference	31	0.5	BK/BU	5404	XII	CBT
32	0.5	BN/YE	2231	V	CBT	Charge Port Valve Motor Close Control	32	0.5	BN/YE	2231	XII	CBT
33	0.5	BU/WH	2230	V	CBT	Charge Port Valve Motor Open Control	33	0.5	BU/WH	2230	XII	CBT
34	0.5	WH/BU	3697	V	—	Charge Port Door Sensor Signal	34	0.5	WH/BU	3697	XII	—

X106 Body Harness to Forward Lamp Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
35	0.5	BN/ BN	1797	V	—	Coolant Level Sensor Signal	35	0.5	BN	1797	XII	—
36	0.5	BK/ BN	1798	II	—	Low Refer- ence	36	0.5	BK/ BN	1798	VIII	—

X110 Forward Lamp Harness to Left Headlight Assembly



2220554

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: MG641238-5
Service Connector: 13579437
Description: 4-Way F 050 Series (BK)

Connector Part Information

Harness Type: Left Headlamp
OEM Connector: Not Available
Service Connector: Service by Harness - See Part Catalog
Description: 4-Way M

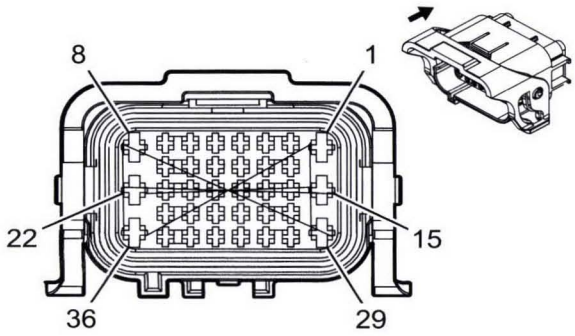
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-12 (BU)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	Pending	No Tool Required	Not Required	Not Required	Not Required	Not Required

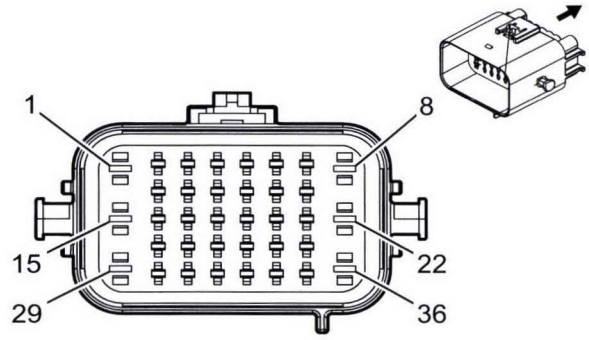
X110 Forward Lamp Harness to Left Headlight Assembly

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	VT/ GY	709	I	TR6	Left Park Lamp Control	1	0.5	VT/ GY	709	II	TR6
2	0.5	BK	50	I	TR6	Ground	2	0.5	BK	50	II	TR6
3	0.5	VT/ WH	639	I	TR6	Run/Crank Ignition 1 Voltage	3	0.5	VT/ WH	639	II	TR6
4	0.5	BN/ YE	189	I	TR6	Headlamp Leveling Motor Control	4	0.5	BN/ YE	189	II	TR6

X115 Body Harness to Engine Harness



1869605



1869606

Connector Part Information

Harness Type: Engine

OEM Connector: 1743059-2

Service Connector: 13580088

Description: 36-Way F Micro Timer II/Junior Power Timer Series (BK)

Connector Part Information

Harness Type: Body

OEM Connector: 1743062-2

Service Connector: 13580089

Description: 36-Way M Micro Timer II/Junior Power Timer Hybrid Series, Sealed (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	N/A	J-35616-35 (VT)	J-38125-36	Not Required	Not Required	Not Required	Not Required
II	N/A	J-35616-14 (GN)	J-38125-560	Not Required	Not Required	Not Required	Not Required
III	13581378	J-35616-34 (YE)	J-38125-560	964265-2	24	E	2
IV	13581378	J-35616-34 (YE)	J-38125-560	964265-2	24	E	2

X115 Body Harness to Engine Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1 - 2	—	—	—	—	—	Not Occupied	1 - 2	—	—	—	—	—
3	0.5	BU/ BN	3787	II	—	High Voltage Energy Management Communica- tion Control	3	0.5	BU/ BN	3787	IV	—
4	0.5	VT/ RD	2965	II	CBT	High Voltage Battery Current Sensor Voltage Reference	4	0.5	VT/ RD	2965	IV	CBT
5	0.5	BK/ BN	6102	II	—	Inside Air Temperature Sensor Low Reference	5	0.35	BK/ BN	6102	IV	—
6	0.5	GN	36	II	—	Coolant Temperature Signal	6	0.35	GN	36	IV	—

X115 Body Harness to Engine Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
7	0.5	BU/ BK	7493	II	—	High Speed GMLAN Serial Data (+)(3)	7	0.5	BU/ BK	7493	IV	—
8	0.5	WH	7494	I	—	High Speed GMLAN Serial Data (-)(3)	8	0.5	WH	7494	III	—
9	0.5	BU/ WH	3977	II	—	Accessory Wakeup Serial Data 2	9	0.35	BU/ WH	3977	IV	—
10	0.5	BU/ VT	2364	II	—	Cooling Fan Speed Signal	10	0.35	BU/ VT	2364	IV	—
11	0.5	BU	204	II	—	A/C Low Pressure Sensor Signal	11	0.35	BU	204	IV	—
12	0.5	WH	6432	II	—	CAN Bus Low Serial Data	12	0.5	BU/ GN	6433	IV	—
13	0.5	BU/ GN	6433	II	—	CAN Bus High Serial Data	13	0.5	WH	6432	IV	—
14	0.5	BU/ RD	474	II	—	5 Volt Refer-ence	14	0.35	BU/ RD	474	IV	—
15 - 17	—	—	—	—	—	Not Occupied	15 - 17	—	—	—	—	—
18	0.5	VT/ BU	3790	II	—	Electric Coolant Motor Feedback Signal	18	0.35	VT/ BU	3790	IV	—
19	0.5	YE/ GN	3789	II	—	Electric Coolant Motor Control	19	0.35	YE/ GN	3789	IV	—
20	0.5	BN/ BU	3788	II	—	Electric Coolant Motor Control	20	0.35	BN/ BU	3788	IV	—
21	0.5	WH/ GN	3794	II	—	Recharge-able Energy Storage System 1 Coolant Motor Control	21	0.35	WH/ GN	3794	IV	—
22	—	—	—	—	—	Not Occupied	22	—	—	—	—	—
23	0.5	YE/ GY	3796	II	—	Recharge-able Energy Storage System 1 Coolant Motor Feedback Signal	23	0.35	YE/ GY	3796	IV	—

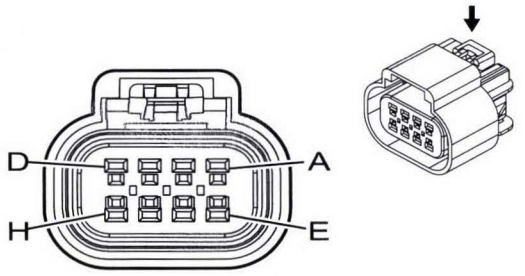
X115 Body Harness to Engine Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
24	0.5	BU/VT	3818	II	—	Rechargeable Energy Storage System Coolant HVAC Mode Motor High Control	24	0.35	BU/VT	3818	IV	—
25	0.5	WH/YE	3819	II	—	Rechargeable Energy Storage System Coolant HVAC Mode Motor Low Control	25	0.35	WH/YE	3819	IV	—
26	0.5	BK/GY	3820	II	—	Rechargeable Energy Storage System Coolant HVAC Mode Sensor Low Reference	26	0.35	BK/GY	3820	IV	—
27	0.5	VT/RD	3821	II	—	Rechargeable Energy Storage System Coolant HVAC Mode Sensor 5 Volt Reference	27	0.35	VT/RD	3821	IV	—
28	0.5	GN/YE	3822	II	—	Rechargeable Energy Storage System Coolant HVAC Mode Sensor Signal	28	0.35	GN/YE	3822	IV	—
29	—	—	—	—	—	Not Occupied	29	—	—	—	—	—
30	0.5	GN/OG	3093	II	CBT	High Voltage Battery Cutoff Module Low Control	30	0.35	GN/OG	3093	IV	CBT
31	0.5	OG/BU	3092	II	CBT	High Voltage Battery Cutoff Module High Control	31	0.35	OG/BU	3092	IV	CBT
32	0.5	WH/BU	5986	II	CBT	Serial Data Communication Enable	32	0.5	WH/BU	5986	IV	CBT
33	0.5	BK/GN	476	II	—	Sensor Low Reference	33	0.35	BK/GN	476	IV	—
34	0.5	BU/VT	3795	II	—	Rechargeable Energy Storage System 1 Coolant Motor Control	34	0.35	BU/VT	3795	IV	—

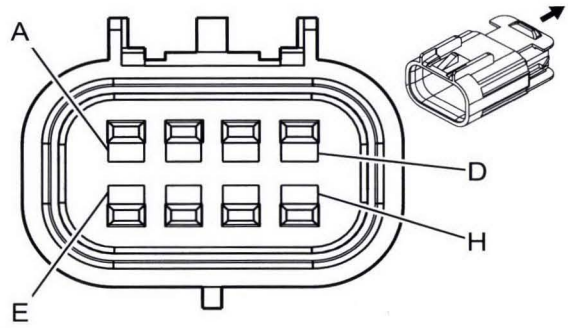
X115 Body Harness to Engine Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
35 - 36	—	—	—	—	—	Not Occupied	35 - 36	-	—	—	—	—

X116 Engine Harness to Forward Lamp Harness



646400



684916

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: 15326835
Service Connector: 13580112
Description: 8-Way F 150 GT Series, Sealed (BK)

Connector Part Information

Harness Type: Engine
OEM Connector: 15326840
Service Connector: 13587152
Description: 8-Way M 150 GT Series, Sealed (BK)

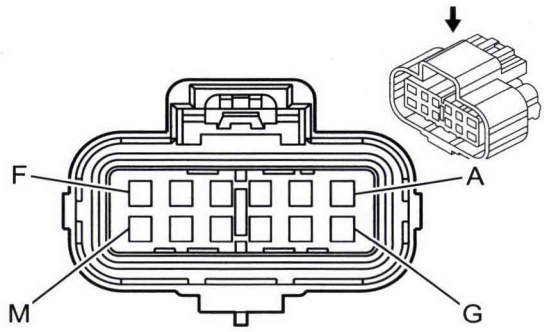
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-3 (GY)	No Tool Required	Not Required	Not Required	Not Required	Not Required

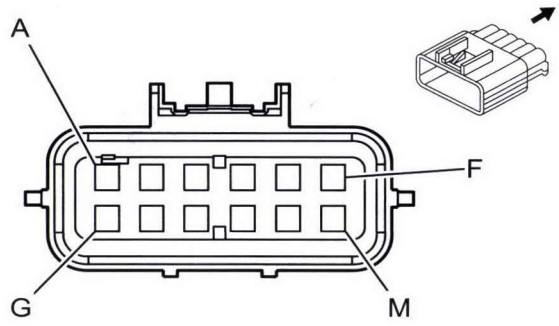
X116 Engine Harness to Forward Lamp Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
A	0.5	GY	830	I	—	Wheel Speed Sensor Signal Left Front	A	0.5	GY	830	II	—
B	0.5	BK/GY	873	I	—	Left Front Wheel Speed Sensor Low Reference	B	0.5	BK/GY	873	II	—
C	0.5	YE	872	I	—	Wheel Speed Sensor Signal Right Front	C	0.5	YE	872	II	—
D	0.5	BK/YE	833	I	—	Wheel Speed Sensor Low Reference Right Front	D	0.5	BK/YE	833	II	—
E	0.5	BN	3891	I	—	Aero Shutter Control	E	0.5	BN	3891	II	—
F	0.5	GY/GN	3954	I	CBT	Control Pilot Signal 1	F	0.5	GY/GN	3954	II	CBT
G	0.5	BU/WH	1314	I	—	Left Front Turn Signal Lamp Control	G	0.5	BU/WH	1314	II	—
H	0.5	VT/GY	709	I	—	Left Park Lamp Control	H	0.5	VT/GY	709	II	—

X117 Engine Harness to Forward Lamp Harness



831372



831369

Connector Part Information

Harness Type: Battery Charger Receptacle

OEM Connector: 15326849

Service Connector: Service by Harness Assembly- See Part Catalog

Description: 12-Way F 150 GT Series, Sealed (BK)

Connector Part Information

Harness Type: Forward Lamp

OEM Connector: 15326854

Service Connector: 88986252

Description: 12-Way M 150 GT Series, Sealed (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	13575397	J-35616-3 (GY)	J-38125-553	15326269	21	E	4

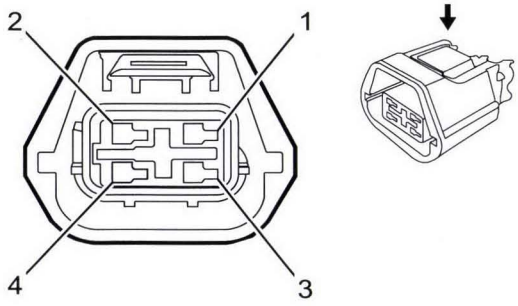
X117 Engine Harness to Forward Lamp Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
A	0.75	D-BU/YE	3953	I	—	Proximity Status Signal 1	A	0.5	BU/YE	3953	II	—
B	0.75	GY/BN	3954	I	—	Control Pilot Signal 1	B	0.5	GY/GN	3954	II	CBT
C	0.75	WH/GY	5239	I	—	Inside Rear View Mirror Vertical Potentiom-eter	C	0.5	GY/GN	5239	II	—
D	0.75	YE/GY	5241	I	—	Inside Rear View Mirror Horizontal Potentiom-eter	D	0.5	YE/GY	5241	II	—
E	0.75	D-GN/VT	5243	I	—	Inside Rear View Mirror Potentiom-eter Ground	E	0.5	GN/VT	5243	II	CBT
F	0.75	VT/BN	3699	I	—	Charge Port Door Switch Signal	F	0.5	VT/BN	3699	II	CBT

X117 Engine Harness to Forward Lamp Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
G	0.75	GY/ D-BU	213	I	—	Charge Port Paddle Temperature Sensor Signal	G	0.5	GY/ BU	213	II	CBT
H	0.75	BK/D-BU	5404	I	—	Charge Port Paddle Temperature Sensor Low Reference	H	0.5	BK/ BU	5404	II	CBT
J	0.75	BN/ YE	2231	I	—	Charge Port Valve Motor Close Control	J	0.5	BN/ YE	2231	II	CBT
K	0.75	D-BU/ WH	2230	I	—	Charge Port Valve Motor Open Control	K	0.5	BU/ WH	2230	II	CBT
L	0.75	WH/ D-BU	3697	I	—	Charge Port Door Sensor Signal	L	0.5	WH/ BU	3697	II	—
M	0.75	D-BU/ WH	750	I	—	Ground	M	0.5	BK	750	II	—

X120 Forward Lamp Harness to Right Headlight Assembly



2220554

Connector Part Information

Harness Type: Forward Lamp
OEM Connector: MG641238-5
Service Connector: 13579437
Description: 4-Way F 050 Series (BK)

Connector Part Information

Harness Type: Right Healight
OEM Connector: Not Available
Service Connector: Service by Harness - See Part Catalog
Description: 4-Way M

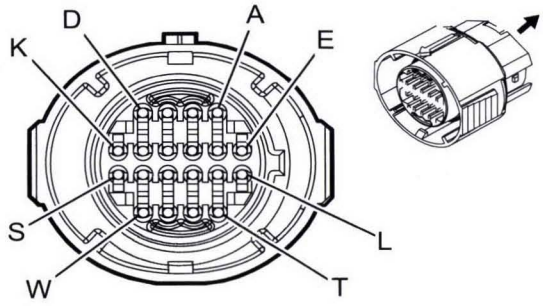
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-12 (BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	Not Required	No Tool Required	Not Required	Not Required	Not Required	Not Required

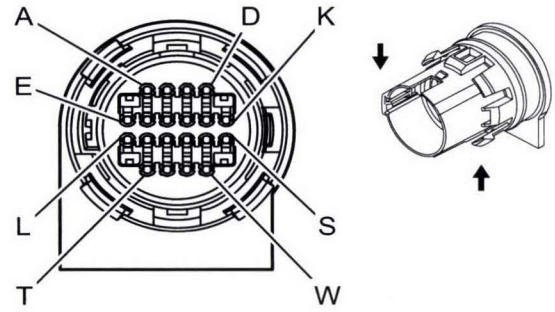
X120 Forward Lamp Harness to Right Headlight Assembly

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	GY/ BN	309	I	TR6	Right Park Lamp Control	1	0.5	GY/ BN	309	II	TR6
2	0.5	BK	150	I	TR6	Ground	2	0.5	BK	150	II	TR6
3	0.5	VT/ WH	639	I	TR6	Run/Crank Ignition 1 Voltage	3	0.5	VT/ WH	639	II	TR6
4	0.5	BN/ YE	189	I	TR6	Headlamp Leveling Motor Control	4	0.5	BN/ YE	189	II	TR6

X175 Engine Harness to Transmission Harness



1922568



1922569

Connector Part Information

Harness Type: Engine
OEM Connector: 13595248
Service Connector: 19256212
Description: 20-Way F Micro Pack 100W Series, Sealed (BK)

Connector Part Information

Harness Type: Transmission
OEM Connector: 15443076
Service Connector: Service by Harness – See Part Catalog
Description: 20-Way M Micro Pack 100W Series, Sealed (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13579969	J-35616-6 (BN)	J-38125-33	12084913	5	W	W
II	Not Available	J-35616-7 (BN)	J-38125-33	12160551	3	W	W

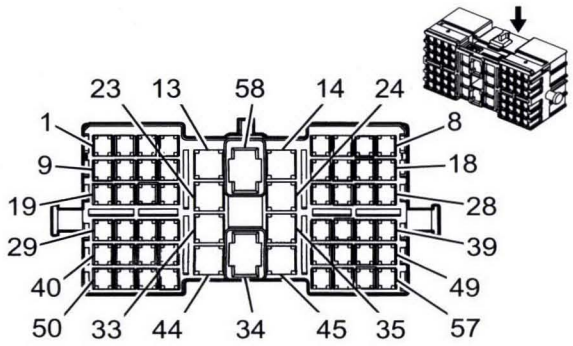
X175 Engine Harness to Transmission Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
A	0.5	VT/WH	5981	I	—	PRNDL A Signal	A	0.5	BK	5981	II	—
B	0.5	GY/BN	5982	I	—	PRNDL B Signal	B	0.5	BK	5982	II	—
C	0.5	WH/BK	5983	I	—	PRNDL C Signal	C	0.5	BK	5983	II	—
D	0.5	GY/WH	4168	I	—	PRNDL P Signal	D	0.5	BK	4168	II	—
E	0.5	BK/WH	3451	I	—	Signal Ground	E	0.5	BK	3451	II	—
F	0.75	VT	3493	I	—	Transmission IMS Mode Switch S bit Signal	F	0.5	BK	3493	II	—
G	0.75	YE/BK	3494	I	—	Transmission IMS Mode Switch R1 bit Signal	G	0.5	BK	3494	II	—
H	0.75	GY	3495	I	—	Transmission IMS Mode Switch R2 bit Signal	H	0.5	BK	3495	II	—

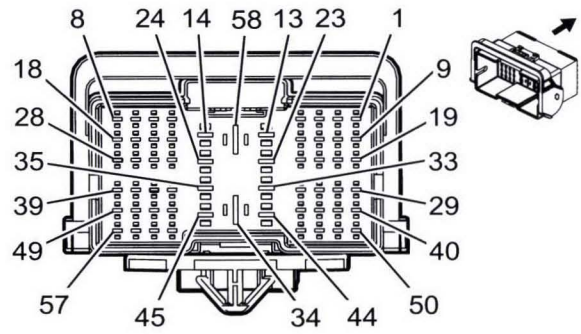
X175 Engine Harness to Transmission Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
J	0.75	BN	3496	I	—	Transmission IMS Mode Switch D1 bit Signal	J	0.5	BK	3496	II	—
K	0.75	GN/ BN	3497	I	—	Transmission IMS Mode Switch D2 bit Signal	K	0.5	BK	3497	II	—
L	0.75	BK/ GY	3927	I	—	IMS Mode Switch Return	L	0.5	BK	3927	II	—
M	0.5	GN/ VT	2032	I	—	Coolant Temperature Sensor Signal	M	0.5	BK	2032	II	—
N	0.5	BK/ BN	2761	I	—	Coolant Temperature Sensor Low Reference	N	0.5	BK	2761	II	—
P	0.75	WH/ GN	3485	I	—	Transmission Traction Power Inverter Module Resolver #2 Excitation Signal Negitive	P	0.5	BK	3485	II	—
R	—	—	—	—	—	Not Occupied	R	—	—	—	—	—
S	0.75	BU/ YE	3488	I	—	Traction Power Inverter Module Resolver #2 S1 Signal	S	0.5	BK	3486	II	—
T	0.75	GY	3487	I	—	Traction Power Inverter Module Resolver #2 S3 Signal	T	0.5	BK	3488	II	—
U	0.75	GN	3491	I	—	Traction Power Inverter Module Resolver #2 S2 Signal	U	0.5	BK	3487	II	—
V	0.75	BN/ YE	3492	I	—	Traction Power Inverter Module Resolver #2 S4 Signal	V	0.5	BK	3491	II	—
W	—	—	—	—	—	Not Occupied	W	—	—	—	—	—

X200 Instrument Panel Harness to Body Harness



2537267



2913660

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 2005281-3
Service Connector: 13395410
Description: 58-Way F 1.6, 2.8, 4.8 Timer Series (GY)

Connector Part Information

Harness Type: Body
OEM Connector: 2109050-3
Service Connector: 19301391
Description: 58-Way M 1.6, 2.8, 5.8 Timer Series (GY)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13575471	J-35616-14 (GN)	J-38125-560	964274-2	3	E	1
II	13575471	J-35616-14 (GN)	J-38125-560	964274-2	3	E	1
III	13575856	J-35616-4A (PU)	J-38125-36	964280-2	22	E	C
IV	13575471	J-35616-14 (GN)	J-38125-560	964274-2	3	E	1
IX	13575574	J-35616-5 (PU)	J-38125-36	Not Available	Not Avail-able	Not Avail-able	Not Avail-able
V	13578858	J-35616-4A (PU)	J-38125-36	Not Available	Not Avail-able	Not Avail-able	Not Avail-able
VI	13575858	J-35616-42 (RD)	J-38125-36	927837-1	20	C	A
VII	13578858	J-35616-4A (PU)	J-38125-36	Not Available	Not Avail-able	Not Avail-able	Not Avail-able
VIII	13575574	J-35616-5 (PU)	J-38125-36	Not Available	Not Avail-able	Not Avail-able	Not Avail-able
X	13575593	J-35616-34 (YE)	J-38125-560	964265-2	24	E	2
XI	13575593	J-35616-34 (YE)	J-38125-560	964265-2	24	E	2
XII	13575593	J-35616-34 (YE)	J-38125-560	964265-2	24	E	C
XIII	13575857	J-35616-42 (RD)	J-38125-36	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

X200 Instrument Panel Harness to Body Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	GN/ GY	3853	II	—	Cabin Heater Coolant Motor Control	1	0.5	GN/ GY	3853	XI	—
2	0.5	VT/ YE	3854	II	—	Cabin Heater Coolant Motor Control	2	0.5	VT/ YE	3854	XI	—
3	0.5	BN/ BU	3852	II	—	Cabin Heater Coolant Motor Feedback Signal	3	0.5	BN/ BU	3852	XI	—
4	—	—	—	—	—	Not Occupied	4	—	—	—	—	—
5	0.35	BN/ VT	193	II	—	Rear Defog Relay Control	5	0.35	BN/ VT	193	XI	—
6	0.5	VT/ BK	7553	II	—	Park Lock Solenoid Control	6	0.5	VT/ BK	7553	XI	—
7	0.35	VT/ BU	3263	I	-CW1	Logistic Mode Relay Open Control	7	0.35	VT/ BU	3263	XI	-CW1
8	0.35	GY/ VT	3264	I	-CW1	Logistic Mode Relay Close Control	8	0.35	GY/ VT	3264	XI	-CW1
9	0.35	GY/ GN	7565	I	—	Windscreen Temp Sensor Signal	9	0.35	GY/ GN	7565	XI	—
10	0.35	GY/ BU	7564	I	—	Humidity Sensor Signal	10	0.35	GY/ BU	7564	XI	—
11	0.35	BK/ BN	6102	I	—	Inside Air Temperature Sensor Low Reference	11	0.35	BK/ BN	6102	XI	—
12	0.35	YE/ RD	597	I	—	5 Volt Refer- ence	12	0.35	YE/ RD	597	XI	—
13	0.5	YE/ BN	3391	III	—	Driver Mirror Motor Common Control	13	0.5	WH	3398	VIII	—
14	1	VT	2101	IV	—	Retained Accessory Power Fuse Ignition	14	1	VT	2101	VIII	—
15	0.35	YE	6817	I	—	LED Backlight Dimming Control	15	0.35	YE	6817	XI	—
16	0.35	BK/ BN	5360	I	—	Brake Apply Sensor Low Reference	16	0.35	BK/ BN	5360	X	—
17	0.35	BU/ YE	5361	I	—	Brake Apply Sensor Signal	17	0.35	BU/ YE	5361	X	—

X200 Instrument Panel Harness to Body Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
18	0.35	WH	5359	I	—	Brake Apply Sensor Control	18	0.35	WH	5359	X	—
19	0.5	BN/WH	419	I	—	Check Engine Indicator Control	19	0.5	BN/WH	419	XI	—
20	0.35	YE/BU	3197	I	—	Humidity Temperature Sensor Signal	20	0.35	YE/BU	3197	X	—
21	—	—	—	—	—	Not Occupied	21	—	—	—	—	—
22	0.35	GY/VT	755	I	—	RAP Relay Coil Control	22	0.35	GY/VT	755	X	—
23	1	RD/BU	2540	V	—	Battery Positive Voltage	23	1	RD/BU	2540	VIII	—
24	0.5	BN/GY	1462	III	C37/C38	Heated Seat Switch Signal	24	0.5	BN/GY	1462	VIII	C38
25	0.5	BU/YE	6105	II	—	High Speed GMLAN Serial Data (+) (2)	25	0.5	BU/YE	6105	XI	—
26	0.5	WH	6106	II	—	High Speed GMLAN Serial Data (-) (2)	26	0.5	WH	6106	XI	—
27	0.35	BU	655	I	-UE1	Cellular Telephone Microphone Signal	27	0.35	BU	655	X	-UE1
28	0.35	BK/BN	654	I	-UE1	Cellular Telephone Microphone Low Reference	28	0.35	BK/BN	654	X	-UE1
29	0.35	BK/WH	651	I	UVC	Signal Ground	29	0.35	BK/WH	651	XI	UVC
30	0.35	GY/YE	6972	I	UVC	Camera Signal 2 +	30	0.35	GY/YE	6972	XI	UVC
31	0.35	WH/BU	6973	I	UVC	Camera Signal 2	31	0.35	WH/BU	6973	XI	UVC
32	0.35	BN/VT	5486	I	—	Run Relay Coil Control	32	0.35	BN/VT	5486	XI	—
33	1	RD/VT	2640	V	—	Battery Positive Voltage	33	1	RD/VT	2640	VIII	—
34	—	—	—	—	—	Not Occupied	34	—	—	—	—	—
35	2	RD/WH	140	VII	—	Battery Positive Voltage	35	2	RD/WH	140	IX	—
36 - 37	—	—	—	—	—	Not Occupied	36 - 37	—	—	—	—	—

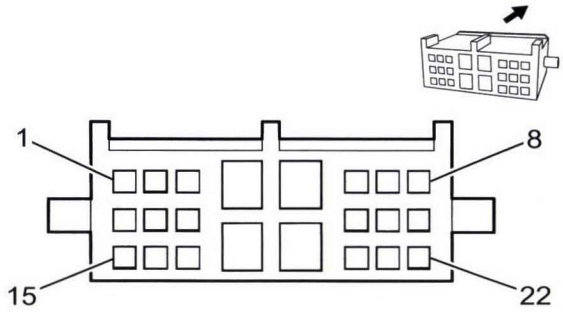
X200 Instrument Panel Harness to Body Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
38	0.75	GN	199	II	—	Left Rear Speaker Control (+)	38	0.75	GN	199	XII	—
39	0.75	GN/ BK	116	II	—	Left Rear Speaker Signal (-)	39	0.75	GN/ BK	116	XII	—
40	0.35	YE/ VT	3956	I	—	Charging Status Indicator Control	40	0.35	YE/ VT	3956	X	—
41	0.35	GY/ GN	3957	I	—	Charging Pilot Signal Indicator Control	41	0.35	GY/ GN	3957	X	—
42	0.35	BK/ GN	3958	I	—	Charging Indicator Low Reference	42	0.35	BK/ GN	3958	X	—
43	0.35	WH/ VT	5905	I	—	Key Capture/ Column Lock Shift Position Signal	43	0.35	WH/ VT	5905	X	BTM
44	1.5	VT	1301	VII	—	Retained Accessory Power Fuse Control	44	1.5	VT	1301	IX	AE3
45	1.5	VT	1701	VII	—	Retained Accessory Power Ignition	45	1.5	VT	1701	IX	AE3
46	—	—	—	—	—	Not Occupied	46	—	—	—	—	—
47	0.5	VT/ BN	141	II	—	Run Ignition 3 Voltage	47	0.5	VT/ BN	141	XI	UD7
48	0.35	GY/ WH	3272	I	—	Remote Function Actuator Control	48	0.35	GY	3273	X	—
49	0.35	BU/ WH	3275	I	—	Remote Function Actuator Receive Signal	49	0.35	YE/ GN	3274	X	—
50	0.35	YE/ GN	3274	I	—	Remote Function Actuator Transmit Signal	50	0.35	BU/ WH	3275	X	—
51	0.35	GY	3273	I	—	Remote Function Actuator Low Reference	51	0.35	GY/ WH	3272	X	—
52	0.35	GN/ WH	2270	I	CD6	Rear Window Washer Relay Control	52	0.35	GN/ WH	2270	X	CD6
53	—	—	—	—	—	Not Occupied	53	—	—	—	—	—
54	0.5	VT/ BU	3390	II	—	Driver Mirror Motor Up (+) Down (-) Control	54	0.5	VT/ BU	3390	XI	(DLS/D71)

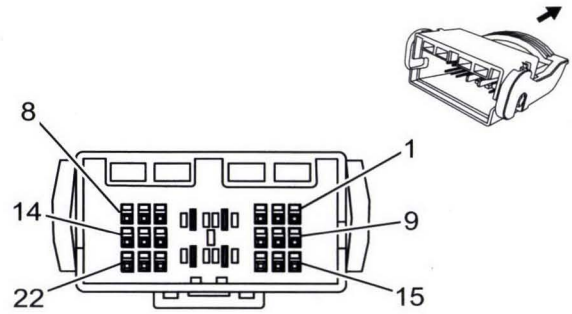
X200 Instrument Panel Harness to Body Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
55	0.5	BN/ BK	3389	II	—	Driver Mirror Motor Right (+) Left (-) Control	55	0.5	BN/ BK	3389	XI	(DLS/D71)
56 - 57	—	—	—	—	—	Not Occupied	56 - 57	—	—	—	—	—
58	2	VT/ GN	39	VI	—	Run/Crank Ignition 1 Voltage	58	2	VT/ GN	39	XIII	—

X210 Instrument Panel Harness to Body Harness



2173982



2220413

Connector Part Information

Harness Type: Body
OEM Connector: 1897543-2
Service Connector: 13395404
Description: 22-Way F 0.64 Micro Quadlock Series, 2.8 MCP Series (BK)

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 1897540-2
Service Connector: 13580994
Description: 22-Way M 2.8 MQS/MCP Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13582286	J-35616-35 (VT)	J-38125-557	1241390-1	8	C	A
II	13575859	J-35616-64B (LT BU)	J-38125-12A	Not Available	Not Available	Not Available	Not Available
III	19331706	J-35616-64B (LT-BU)	J-38125-215A	Not Required	Not Required	Not Required	Not Required
IV	13575569	J-35616-65B (LT BU)	J-38125-12A	Not Available	Not Available	Not Available	Not Available
V	13575569	J-35616-65B (LT BU)	J-38125-12A	Not Available	Not Available	Not Available	Not Available

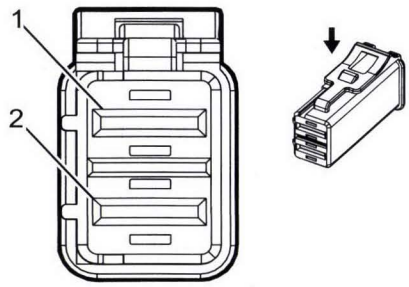
X210 Instrument Panel Harness to Body Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	BU/BK	7493	III	—	High Speed GMLAN Serial Data (+)(3)	1	0.5	BU/BK	7493	IV	—
2	0.5	WH	7494	III	—	High Speed GMLAN Serial Data (-)(3)	2	0.5	WH	7494	IV	—
3 - 5	—	—	—	—	—	Not Occupied	3 - 5	—	—	—	—	—
6	0.5	GN	5060	III	—	Low Speed GMLAN Serial Data	6	0.5	GN	5060	IV	—
7	0.35	GN/BK	3558	II	BTM	Passive Start Switch Signal 2	7	0.35	GN/BK	3558	IV	BTM

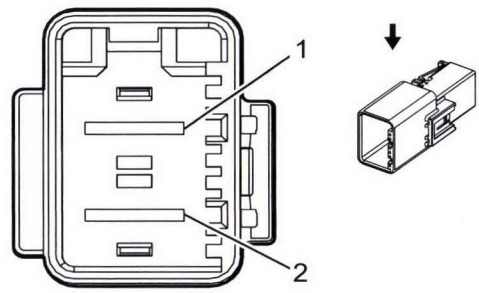
X210 Instrument Panel Harness to Body Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
8	0.35	BK/ GY	3559	II	BTM	Passive Start Switch 2 Low Reference	8	0.35	BK/ GY	3559	IV	BTM
9	0.5	BN/ YE	189	III	TR6	Headlamp Leveling Motor Control	9	0.5	BN/ YE	189	IV	TR6
10	0.35	BK/ BN	6102	II	—	Inside Air Temperature Sensor Low Reference	10	0.35	BK/ BN	6102	IV	—
11	0.35	GN	36	II	—	Coolant Temperature Signal	11	0.35	GN	36	IV	—
12	0.5	RD/ WH	640	III	—	Battery Positive Voltage	12	0.5	RD/ WH	640	IV	—
13	0.5	RD/ WH	640	III	—	Battery Positive Voltage	13	0.5	RD/ WH	640	IV	—
14	—	—	—	—	—	Not Occupied	14	—	—	—	—	—
15	0.5	VT/ WH	1159	III	—	External Speaker Signal (+)	15	0.5	VT/ WH	1159	IV	—
16	0.5	GY/ BK	1160	III	—	External Speaker Signal (-)	16	0.5	GY/ BK	1160	IV	—
17	0.35	YE	6817	II	EF7/Z49	LED Backlight Dimming Control	17	0.35	YE	6817	IV	EF7/Z49
18	—	—	—	—	—	Not Occupied	18	—	—	—	—	—
19	1.5	VT	1301	I	AE3	Retained Accessory Power Fuse Control	19	1.5	VT	1301	V	—
20	0.5	WH	6432	III	—	CAN Bus Low Serial Data	20	0.5	WH	6432	IV	—
21	0.5	BU/ GN	6433	III	—	CAN Bus High Serial Data	21	0.5	BU/ GN	6433	IV	—
22	0.5	WH/ BU	5986	III	—	Serial Data Communica- tion Enable	22	0.5	WH/ BU	5986	IV	—

X215 Body Harness to Instrument Panel Harness



2684403



2537249

Connector Part Information

Harness Type: Body

OEM Connector: 936619-2

Service Connector: Service by Harness Assembly- See Part Catalog

Description: 2-Way F MCP 9.5 Series (BK)

Connector Part Information

Harness Type: Instrument Panel

OEM Connector: 1897198-2

Service Connector: Service by Harness Assembly- See Part Catalog

Description: 2-Way M MCP 9.5 Series (BK)

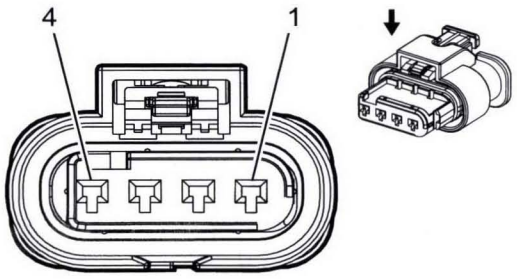
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-22 (RD)	Not Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-21 (RD)	Not Required	Not Required	Not Required	Not Required	Not Required

X215 Body Harness to Instrument Panel Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	10	RD/ WH	2740	I	—	Battery Positive Voltage	1	8	RD/ GN	1540	II	—
2	10	RD/ GN	1540	I	—	Battery Positive Voltage	2	10	RD/ WH	2740	II	—

X235 Instrument Panel Harness to Inflatable Restraint Module Jumper



2684560

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 1-2141402-4
Service Connector: 13586137
Description: 4-Way F 1.2 Series, Sealed (YE)

Connector Part Information

Harness Type: Inflatable Restraint Module
OEM Connector: Not Available
Service Connector: Service by Harness - See Part Catalog
Description: 4-Way M 1.2 Series, Sealed (YE)

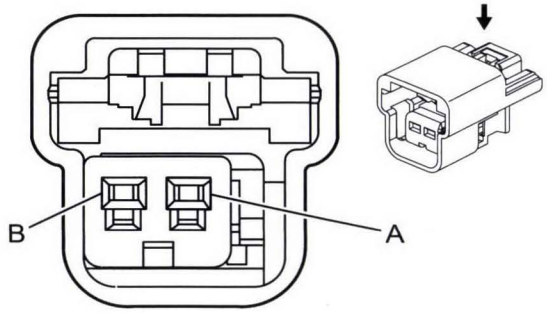
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-64B (L-BU)	Not Available	Not Available	Not Available	Not Available	Not Available
II	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

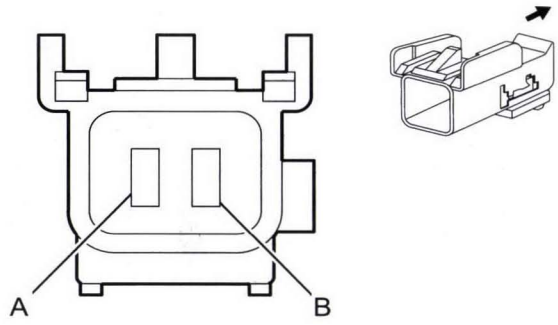
X235 Instrument Panel Harness to Inflatable Restraint Module Jumper

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	YE/OG	3025	I	AYF/AW7	Passenger IP Module Stage 1 High Control	1	0.5	YE/OG	3025	II	-
2	0.5	OG/WH	3024	I	AYF/AW7	Passenger IP Module Stage 1 Low Control	2	0.5	OG/WH	3024	II	-
3	0.5	GY/OG	3027	I	AYF/AW7	Passenger IP Module Stage 2 High Control	3	0.5	GY/OG	3027	II	-
4	0.5	OG/VT	3026	I	AYF/AW7	Passenger IP Module Stage 2 Low Control	4	0.5	OG/VT	3026	II	-

X236 Instrument Panel Harness to Air Duct Jumper



1385747



872877

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 15332129
Service Connector: 15306425
Description: 2-Way F 150 GT Series (BK)

Connector Part Information

Harness Type: Air Duct Jumper
OEM Connector: 15332130
Service Connector: Service by Harness - See Part Catalog
Description: 2-Way M 150 GT Series (BK)

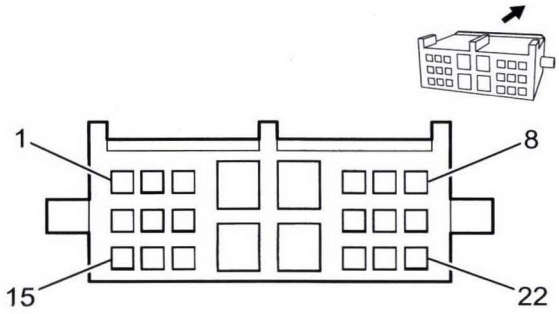
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-14 (GN)	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	Not Required	No Tool Required	Not Required	Not Required	Not Required	Not Required

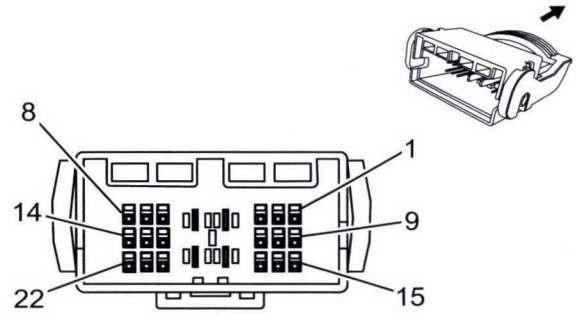
X236 Instrument Panel Harness to Air Duct Jumper

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
A	—	—	—	—	—	Not Occupied	A	—	—	—	—	—
B	0.5	BN/BK	405	I	—	Lower Air Temperature Sensor Signal	B	0.5	BN/BK	405	II	—

X310 Body Harness to Instrument Panel Harness



2173982



2220413

Connector Part Information

Harness Type: Body
OEM Connector: 1897543-2
Service Connector: 13395404
Description: 22-Way F 0.64 Micro Quadlock Series, 2.8 MCP Series (BK)

Connector Part Information

Harness Type: Instrument Panel
OEM Connector: 1897540-2
Service Connector: 13580994
Description: 22-Way M 2.8 MQS/MCP Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13582285	J-35616-35 (VT)	J-38125-557	1241388-1	7	E	C
II	13582285	J-35616-35 (VT)	J-38125-557	1241388-1	7	E	C
III	13575569	J-35616-65B (LT BU)	J-38125-12A	Not Available	Not Available	Not Available	Not Available
IV	13575574	J-35616-5 (PU)	J-38125-36	Not Available	Not Available	Not Available	Not Available
V	13575574	J-35616-5 (PU)	J-38125-36	Not Available	Not Available	Not Available	Not Available

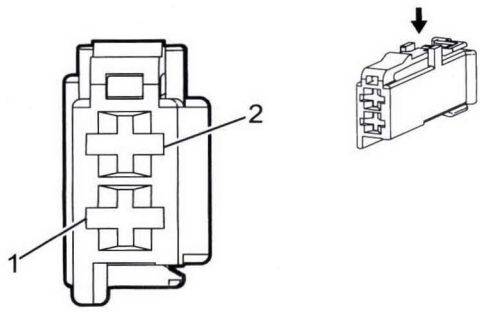
X310 Body Harness to Instrument Panel Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	YE/ BU	1505	II	C38	Passenger Heated Seat Switch Signal	1	0.5	YE/ BU	1505	III	C37/C38
2	0.5	BU/ BK	7493	II	—	High Speed GMLAN Serial Data (+)(3)	2	0.5	BU/ BK	7493	III	—
3	0.5	WH	7494	II	—	High Speed GMLAN Serial Data (-)(3)	3	0.5	WH	7494	III	—
4 - 5	—	—	—	—	—	Not Occupied	4 - 5	—	—	—	—	—
6	0.35	YE	658	II	UE1	Cellular Telephone Voice Signal	6	0.35	YE	658	IV	UE1

X310 Body Harness to Instrument Panel Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
7	0.35	BK/YE	659	II	UE1	Cellular Telephone Voice Low Reference	7	0.35	BK/YE	659	IV	UE1
8	0.5	BK/WH	551	II	UE1	Signal Ground	8	0.5	BK/WH	551	III	UE1
9	0.5	WH	6432	II	—	CAN Bus Low Serial Data	9	0.5	WH	6432	III	—
10	0.5	BU/GN	6433	II	—	CAN Bus High Serial Data	10	0.5	BU/GN	6433	III	—
11	0.35	VT/BK	3	II	BTM	Run/Crank Ignition 1 Voltage	11	0.35	VT/BK	3	IV	BTM
12	0.5 0.5	BU BU	2500 2500	II	UE1 -UE1	High Speed GMLAN Serial Data (+) (1)	12	0.5 0.5	BU BU	2500 2500	III IV	— —
13	0.5 0.5	WH WH	2501 2501	II	UE1 -UE1	High Speed GMLAN Serial Data (-) (1)	13	0.5	WH	2501	III	—
14	0.35	VT/YE	4	II	BTM	Accessory Ignition Voltage	14	0.35	VT/YE	4	IV	BTM
15	0.5	GN/BK	3396	II	(DLS/D71)	Passenger Mirror Motor Right (+) Left (-) Control	15	0.5	GN/BK	3396	III	—
16	0.5	YE/VT	3397	II	(DLS/D71)	Passenger Mirror Motor Up (+) Down (-) Control	16	0.5	YE/VT	3397	III	—
17	0.5	RD/YE	2340	II	UE1	Battery Positive Voltage	17	0.5	RD/YE	2340	III	UE1
18	0.75	WH	46	I	—	Right Rear Speaker Control (+)	18	0.75	WH	46	V	—
19	0.75	BU/BK	115	I	—	Right Rear Speaker Signal (-)	19	0.75	BU/BK	115	V	—
20	0.35	GY/YE	5149	II	UE1	Voice Recognition Audio Signal	20	0.35	GY/YE	5149	IV	UE1
21	0.35	BK/GY	5152	II	UE1	Voice Recognition Audio Low Reference	21	0.35	BK/GY	5152	IV	UE1
22	0.5	BK	2550	II	UE1	Ground	22	0.5	BK	2550	III	UE1

X351 Auxiliary Battery Cable Harness to High Voltage Interlock Loop Harness



4073527

—

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 13967105
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 1.6 Micro Timer Series (GY)

Connector Part Information

Harness Type: High Voltage Interlock Loop
OEM Connector: Not Available
Service Connector: Service by Harness - See Part Catalog
Description: 2-Way M

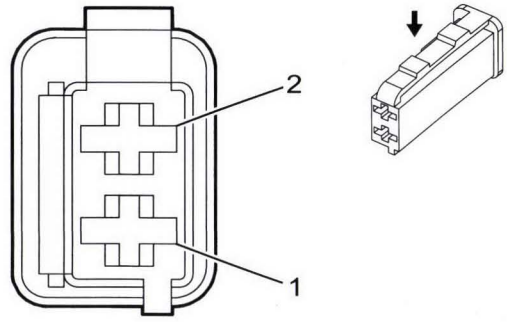
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-14 (GN)	Not Available	Not Available	Not Available	Not Available	Not Available
II	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

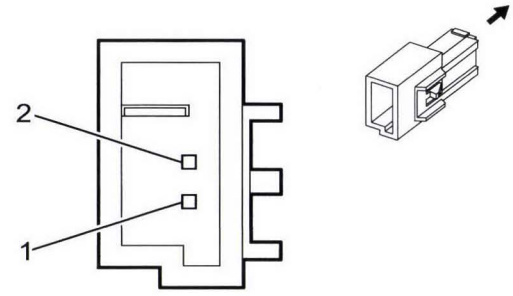
X351 Auxiliary Battery Cable Harness to High Voltage Interlock Loop Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	VT/WH	5087	I	—	High Voltage Interlock Loop Signal (1)	1	0.5	VT	5087	II	—
2	0.5	VT	5087	I	—	High Voltage Interlock Loop Signal (1)	2	0.5	VT	5087	II	—

X352 Auxiliary Battery Cable Harness to High Voltage Interlock Loop Harness



2339593



2179778

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 13670097
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 2-Way F 1.6 Timer Series (BK)

Connector Part Information

Harness Type: High Voltage Interlock Loop
OEM Connector: Not Available
Service Connector: Service by Harness - See Part Catalog
Description: 2-Way M

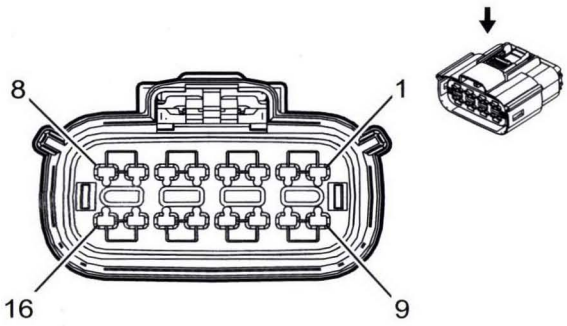
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Available	J-35616-14 (GN)	Not Available	Not Available	Not Available	Not Available	Not Available
II	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

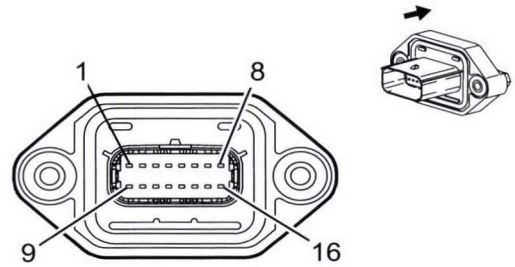
X352 Auxiliary Battery Cable Harness to High Voltage Interlock Loop Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	VT	5087	I	—	High Voltage Interlock Loop Signal (1)	1	0.5	VT	5087	II	—
2	0.5	VT/ WH	5087	I	—	High Voltage Interlock Loop Signal (1)	2	0.5	VT	5087	II	—

X357 Body Harness to Battery Harness



2913662



4073657

Connector Part Information

Harness Type: Body
OEM Connector: 54241630
Service Connector: 13577550
Description: 16-Way F 1.5 Series, Sealed (BK)

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 13830594
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 16-Way M 1.5 Series, Sealed (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13579989	J-35616-2A (GY)	J-38125-560	Not Available	Not Available	Not Available	Not Available
II	Not Required	J-35616-3 (GY)	No Tool Required	Not Required	Not Required	Not Required	Not Required

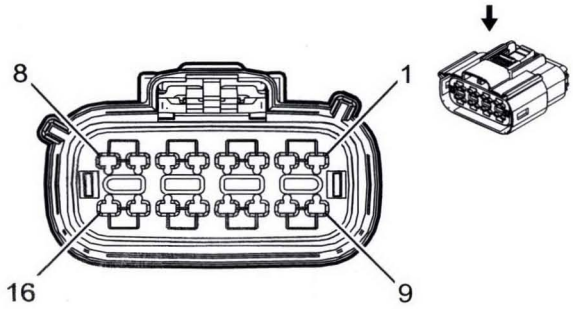
X357 Body Harness to Battery Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	RD/VT	1640	I	—	Battery Positive Voltage	1	0.35	RD/VT	1640	II	—
2	0.5	BK	2050	I	—	Ground	2	0.35	BK	150	II	—
3	0.5	BU/WH	3977	I	—	Accessory Wakeup Serial Data 2	3	0.35	D-BU/WH	3977	II	—
4	0.5	RD/GY	402	I	—	Battery Positive Voltage	4	0.35	VT/GY	402	II	—
5	0.5	BU	2500	I	—	High Speed GMLAN Serial Data (+) (1)	5	0.5	D-BU	2500	II	—
6	0.5	WH	2501	I	—	High Speed GMLAN Serial Data (-) (1)	6	0.5	WH	2501	II	—
7	0.5	BU	2500	I	—	High Speed GMLAN Serial Data (+) (1)	7	0.5	D-BU	2500	II	—

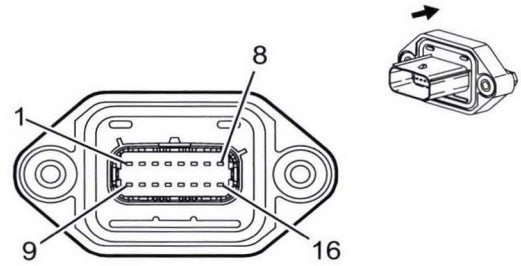
X357 Body Harness to Battery Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
8	0.5	WH	2501	I	—	High Speed GMLAN Serial Data (-) (1)	8	0.5	WH	2501	II	—
9	0.5	WH	6432	I	—	CAN Bus Low Serial Data	9	0.5	D-BU/GY	6432	II	—
10	0.5	BU/GN	6433	I	—	CAN Bus High Serial Data	10	0.5	WH	6433	II	—
11 - 12	—	—	—	—	—	Not Occupied	11 - 12	—	—	—	—	—
13	0.5	BU/GY	5139	I	—	High Voltage Fault Signal	13	0.35	D-BU/GY	5139	II	—
14	0.5	BU/BN	3787	I	—	High Voltage Energy Management Communica-tion Control	14	0.35	D-BU/BN	3787	II	—
15 - 16	—	—	—	—	—	Not Occupied	15 - 16	-	—	—	—	—

X358 Body Harness to Battery Harness



2913661



4073209

Connector Part Information

Harness Type: Body
OEM Connector: 54241631
Service Connector: 19301383
Description: 16-Way F 1.5 Series (GY)

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 13839320
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 16-Way M 1.5 Series, Sealed (GY)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13579989	J-35616-2A (GY)	J-38125-560	Not Available	Not Available	Not Available	Not Available
II	Not Available	J-35616-3 (GY)	J-38125-12A	Not Available	Not Available	Not Available	Not Available

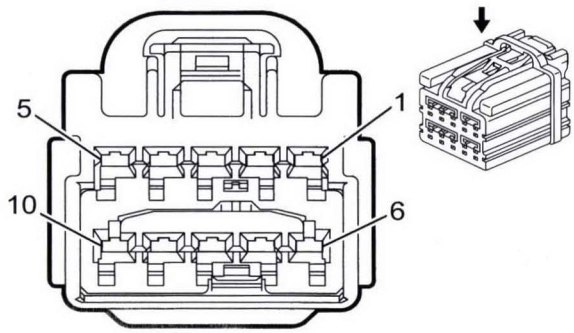
X358 Body Harness to Battery Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	BK/BN	5088	I	—	High Voltage Interlock Loop Low Reference (1)	1	0.5	VT/WH	5087	II	—
2	0.5	VT	5087	I	—	High Voltage Interlock Loop Signal (1)	2	0.5	BK/BN	5088	II	—
3 - 4	—	—	—	—	—	Not Occupied	3 - 4	—	—	—	—	—
5	0.5	BK	2050	I	—	Ground	5	0.35	BK	150	II	—
6	—	—	—	—	—	Not Occupied	6	—	—	—	—	—
7	0.5	VT/GY	3961	I	—	High Voltage Battery (-) Relay Control	7	0.35	VT/GY	3961	II	—
8	0.5	GY/BU	3960	I	—	High Voltage Battery 2 (+) Relay Control	8	0.35	GY/D-BU	3960	II	—

X358 Body Harness to Battery Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
9	0.5	WH/ VT	5137	I	—	Precharge Relay PWM Signal	9	0.35	WH/ VT	5137	II	—
10	0.5	BN/ GN	3959	I	—	High Voltage Battery 1 (+) Relay Control	10	0.35	BN/L-GN	3959	II	—
11	0.5	WH/ BN	3963	I	—	High Voltage Battery 3 (-) Relay Control	11	0.35	WH/ BN	3963	II	—
12	0.5	YE/ VT	3962	I	—	High Voltage Battery 3 (+) Relay Control	12	0.35	YE/ VT	3962	II	—
13	—	—	—	—	—	Not Occupied	13	—	—	—	—	—
14	0.5	VT	3195	I	—	Auxiliary Heater Control	14	0.35	VT	3195	II	—
15 - 16	—	—	—	—	—	Not Occupied	15 - 16	-	—	—	—	—

X359 Auxiliary Battery Cable Harness to Low Voltage Harness



1733159

Connector Part Information

Harness Type: Auxiliary Battery Cable
OEM Connector: 10847018
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 10-Way F Kaizen YESC Series (L-GY)

Connector Part Information

Harness Type: Low Voltage
OEM Connector: Not Available
Service Connector: Service by Harness - See Part Catalog
Description: 10-Way M

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	Not Required	No Tool Required	Not Required	Not Required	Not Required	Not Required

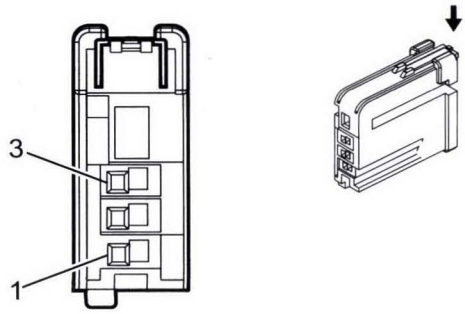
X359 Auxiliary Battery Cable Harness to Low Voltage Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.35	BK	150	I	—	Ground	1	0.35	BK	150	II	—
2	0.35	VT/ GY	3961	I	—	High Voltage Battery (-) Relay Control	2	0.35	VT/ GY	3961	II	—
3	0.35	YE/ VT	3962	I	—	High Voltage Battery 3 (+) Relay Control	3	0.35	YE/ VT	3962	II	—
4	0.35	VT	3195	I	—	Auxiliary Heater Control	4	0.35	VT	3195	II	—
5	0.35	WH/ VT	5137	I	—	Precharge Relay PWM Signal	5	0.35	WH/ VT	5137	II	—
6	0.35	WH/ BN	3963	I	—	High Voltage Battery 3 (-) Relay Control	6	0.35	WH/ BN	3963	II	—
7	0.35	GY/ D-BU	3960	I	—	High Voltage Battery 2 (+) Relay Control	7	0.35	GY/ D-BU	3960	II	—

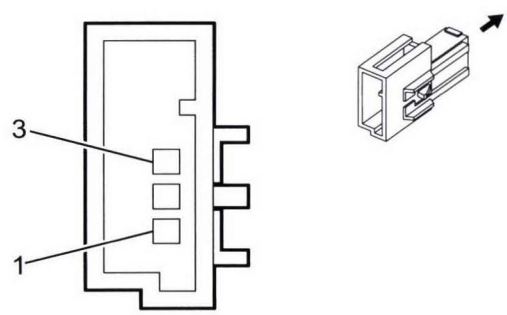
X359 Auxiliary Battery Cable Harness to Low Voltage Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
8	0.35	BN/L-GN	3959	I	—	High Voltage Battery 1 (+) Relay Control	8	0.35	BN/L-GN	3959	II	—
9	0.35	RD/VT	1640	I	—	Battery Positive Voltage	9	0.35	RD/VT	1640	II	—
10	0.35	BK	150	I	—	Ground	10	0.35	BK	150	II	—

X405 Body Extension Harness to Body Harness



2831062



2179788

Connector Part Information

Harness Type: Body Extension
OEM Connector: AIT2PB-03B-1AK
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 3-Way F 0.64 Series (BK)

Connector Part Information

Harness Type: Body
OEM Connector: AIT2WSB-03A-1AK
Service Connector: 13579450
Description: 3-Way M 0.64 Series (BK)

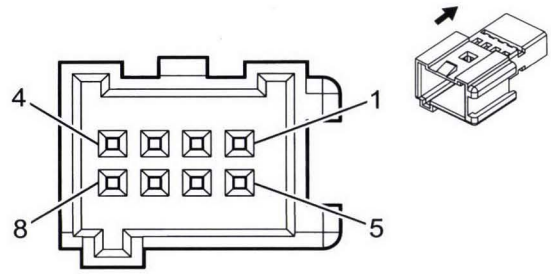
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-2A (GY)	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-65B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

X405 Body Extension Harness to Body Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	YE	141	I	UD7	Run Ignition 3 Voltage	1	0.5	VT/ BN	141	II	UD7
2	0.5	BK/ GY	24	I	UD7	Backup Lamp Control	2	0.5	GN/ WH	24	II	UD7
3	0.5	YE/ VT	1250	I	UD7	Ground	3	0.5	BK	1250	II	UD7

X410 Body Harness to Left Rear Lamp Harness



2817418

Connector Part Information

Harness Type: Left Rear Lamp
OEM Connector: Not Available
Service Connector: Service by Harness - See Part Catalog
Description: 8-Way F

Connector Part Information

Harness Type: Body
OEM Connector: 284869-1
Service Connector: 19301392
Description: 8-Way M 0.64 Micro Quadlock Series (BK)

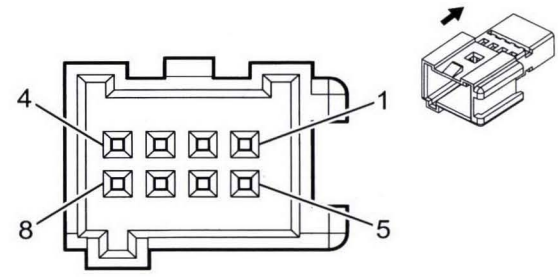
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	No Required	No Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-65B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required
III	Not Required	J-35616-65B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

X410 Body Harness to Left Rear Lamp Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.75	BK	1150	I	EF7/Z49	Ground	1	0.75	BK	1150	III	EF7/Z49
2 - 3	–	–	–	–	–	Not Occupied	2 - 3	–	–	–	–	–
4	0.5	BK	1150	I	EF7/Z49	Ground	4	0.5	BK	1150	II	EF7/Z49
5	0.5	GN/ WH	24	I	EF7/Z49	Backup Lamp Control	5	0.5	GN/ WH	24	II	EF7/Z49
6	0.75	BU/ WH	1334	I	EF7/Z49	Left Rear Turn Signal Lamp Control	6	0.75	BU/ WH	1334	III	EF7/Z49
7	0.5	VT/ GY	709	I	EF7/Z49	Left Park Lamp Control	7	0.5	VT/ GY	709	II	EF7/Z49
8	0.5	GY/ YE	7542	I	EF7/Z49	Left Rear Stop Lamp Control	8	0.5	GY/ YE	7542	II	EF7/Z49

X420 Body Harness to Right Rear Lamp Harness



2817418

Connector Part Information

Harness Type: Right Rear Lamp
OEM Connector: Not Available
Service Connector: Service by Harness - See Part Catalog
Description: 8-Way F

Connector Part Information

Harness Type: Body
OEM Connector: 284869-1
Service Connector: 19301392
Description: 8-Way M 0.64 Micro Quadlock Series (BK)

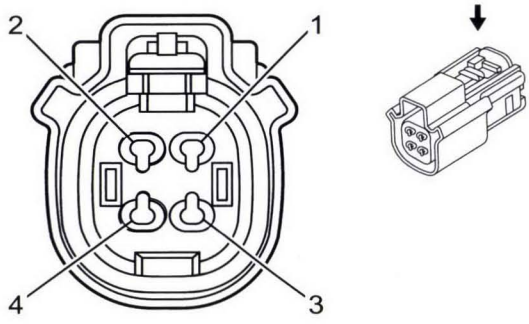
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	Not Required	No Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-65B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required
III	Not Required	J-35616-65B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

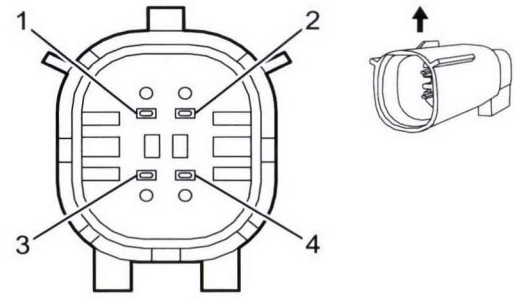
X420 Body Harness to Right Rear Lamp Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.75	BK	950	I	EF7/Z49	Ground	1	0.75	BK	950	III	EF7/Z49
2 - 3	–	–	–	–	–	Not Occupied	2 - 3	–	–	–	–	–
4	0.5	BK	950	I	EF7/Z49	Ground	4	0.5	BK	950	II	EF7/Z49
5	0.5	GN/ WH	24	I	EF7/Z49	Backup Lamp Control	5	0.5	GN/ WH	24	II	EF7/Z49
6	0.75	BU/ VT	1335	I	EF7/Z49	Right Rear Turn Signal Lamp Control	6	0.75	BU/ VT	1335	III	EF7/Z49
7	0.5	GY/ BN	309	I	EF7/Z49	Right Park Lamp Control	7	0.5	GY/ BN	309	II	EF7/Z49
8	0.5	WH/ YE	7541	I	EF7/Z49	Right Rear Stop Lamp Control	8	0.5	WH/ YE	7541	II	EF7/Z49

X450 Body Jumper Harness to Rear Bumper Harness



1960031



2368875

Connector Part Information

Harness Type: Body Extension

OEM Connector: 33472-0406

Service Connector: Service by Harness Assembly- See Part Catalog

Description: 4-Way F 150 MX Series, Sealed (BK)

Connector Part Information

Harness Type: Back up Alarm

OEM Connector: 33482-0401

Service Connector: Service by Harness - See Part Catalog

Description: 4-Way M 150 MX Series, Sealed (BK)

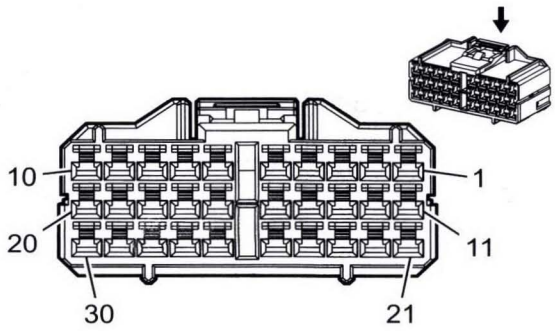
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-3 (GY)	No Tool Required	Not Required	Not Required	Not Required	Not Required

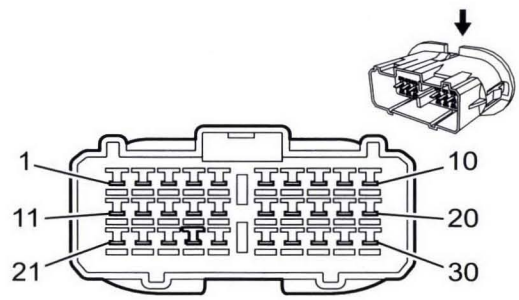
X450 Body Jumper Harness to Rear Bumper Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	VT/ BN	2375	I	UD7	Left Rear Corner Object Sensor Signal	1	0.5	YE	2375	II	UD7
2	0.5	GN/ WH	2379	I	UD7	Object Sensor Low Reference	2	0.5	BK/ GY	2379	II	UD7
3	0.5	BK	2378	I	UD7	Right Rear Corner Object Sensor Signal	3	0.5	YE/ VT	2378	II	UD7
4	0.5	BK/ GY	2379	I	—	Object Sensor Low Reference	4	0.5	BK/ GY	2379	II	UD7

X500 Body Harness to Driver Door Harness



2268719



2268718

Connector Part Information

Harness Type: Body
OEM Connector: 1897527-1
Service Connector: 13584405
Description: 30-Way F 090 Series (WH)

Connector Part Information

Harness Type: Driver Door
OEM Connector: 1897524-1
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 30-Way M 090 Series (WH)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13580004	J-35616-18 (BK)	J-38125-553	Not Available	Not Available	Not Available	Not Available
II	13578820	J-35616-3 (GY)	J-38125-12A	Not Available	Not Available	Not Available	Not Available
III	13578817	J-35616-18 (BK)	J-38125-553	Not Available	Not Available	Not Available	Not Available
IV	Not Required	J-35616-19 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required
V	Not Required	J-35616-19 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required
VI	Not Required	J-35616-19 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required

X500 Body Harness to Driver Door Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	1.5	VT	1701	III	AE3	Retained Accessory Power Ignition	1	1.5	VT	1701	V	AE3
2	0.75	BN/YE	294	I	—	Door Lock Actuator Unlock Control	2	0.75	BN/YE	294	VI	—
3	1.5	BN/YE	3385	III	AE3	Power Window Switch Passenger Down Signal	3	1.5	BN/YE	3385	V	AE3

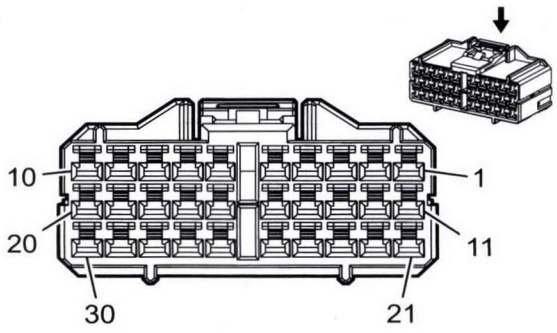
X500 Body Harness to Driver Door Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
4	1.5	YE/ BK	3384	III	AE3	Power Window Switch Passenger Up Signal	4	1.5	YE/ BK	3384	V	AE3
5	2	BK	750	III	—	Ground	5	2	BK	750	IV	—
6	1.5	BN/ BU	1187	III	AE3	Power Window Switch Left Rear Down Signal	6	1.5	BN/ BU	1187	V	—
7	1.5	GN/ GY	1185	III	AE3	Power Window Switch Left Rear Up Signal	7	1.5	GN/ GY	1185	V	AE3
8	0.5	BN/ BK	3389	I	(DLS/D71)	Driver Mirror Motor Right (+) Left (-) Control	8	0.5	BN/ BK	3389	VI	(DLS/D71) +-EF7-Z49
9	0.5	OG/ GN	2132	I	AYF/AW7	Left Front Side Impact Sensing Module Signal	9	0.5	OG/ GN	2132	VI	(AYF/AW7)
10	0.5	BK/ OG	6628	I	AYF/AW7	Left Front Side Impact Sensing Module Low Reference	10	0.5	BK/ OG	6628	VI	(AYF/AW7)
11	1.5	VT	1301	III	AE3	Retained Accessory Power Fuse Control	11	1.5	VT	1301	V	AE3
12	0.75	GY	5911	II	—	Door Lock Actuator Lock Control 2	12	0.75	GY	5911	VI	—
13	1.5	BN/ BU	1188	III	AE3	Power Window Switch Right Rear Down Signal	13	1.5	BN/ BU	1188	V	AE3
14	1.5	GN/ GY	1186	III	AE3	Power Window Switch Right Rear Up Signal	14	1.5	GN/ GY	1186	V	AE3
15	0.35	YE/ BN	1123	I	AU3	Door Lock Key Switch Lock Signal	15	0.75	YE/ BN	1123	VI	AU3
16	0.35	BU/ VT	1124	I	AU3	Door Lock Key Switch Unlock Signal	16	0.75	BU/ VT	1124	VI	AU3
17	1.5	BU/ WH	1307	III	AE3	Power Window Master Switch Lockout Signal	17	1.5	BU/ WH	1307	V	AE3
18	0.5	BK	650	I	—	Ground	18	0.5	BK	650	VI	—

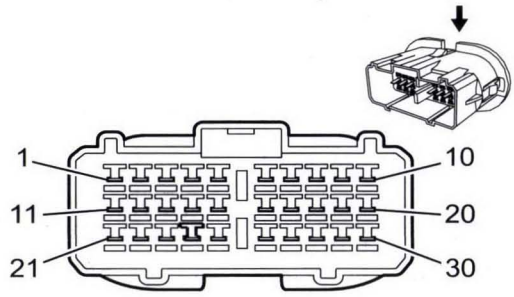
X500 Body Harness to Driver Door Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
19	0.5	VT/ BU	3390	I	—	Driver Mirror Motor Up (+) Down (-) Control	19	0.5	VT/ BU	3390	VI	—
20	0.5	YE/ BN	3391	I	—	Driver Mirror Motor Common Control	20	0.5	YE/ BN	3391	VI	(DLS/D71) +-EF7-Z49
21	0.35	BN/ YE	780	II	EF7/Z49	Driver Door Lock Switch Lock Signal	21	0.5	BN/ YE	780	VI	—
22	0.35	BN/ WH	781	II	EF7/Z49	Driver Door Lock Switch Unlock Signal	22	0.5	BN/ WH	781	VI	—
23	0.35	YE	6817	I	—	LED Backlight Dimming Control	23	0.5	YE	6817	VI	—
24	0.5	OG/ GY	2132	I	—	Left Front Side Impact Sensing Module Signal	24	0.5	OG/ GY	2132	VI	—
25	0.5	BU/ WH	1314	I	—	Left Front Turn Signal Lamp Control	25	0.5	BU/ WH	1314	VI	—
26	—	—	—	—	—	Not Occupied	26	—	—	—	—	—
27	0.5	BK	650	I	—	Ground	27	0.5	BK	650	VI	—
28 - 30	—	—	—	—	—	Not Occupied	28 - 30	-	—	—	—	—

X600 Passenger Door Harness to Body Harness



2268719



2268718

Connector Part Information

Harness Type: Body
OEM Connector: 1897527-1
Service Connector: 13584405
Description: 30-Way F 090 Series (WH)

Connector Part Information

Harness Type: Passenger Door
OEM Connector: 1897524-1
Service Connector: Service by Harness - See Part Catalog
Description: 30-Way M 090 Series (WH)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13578820	J-35616-3 (GY)	J-38125-12A	Not Available	Not Available	Not Available	Not Available
II	13578820	J-35616-3 (GY)	J-38125-12A	Not Available	Not Available	Not Available	Not Available
III	13578820	J-35616-3 (GY)	J-38125-12A	Not Available	Not Available	Not Available	Not Available
IV	Not Required	J-35616-19 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required
V	Not Required	J-35616-19 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required
V	Not Required	J-35616-19 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required

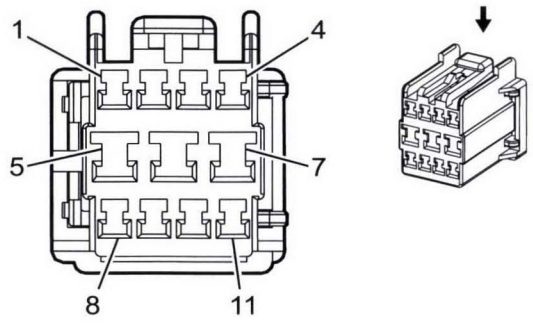
X600 Passenger Door Harness to Body Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	—	—	—	—	—	Not Occupied	1	—	—	—	—	—
2	0.5	BN/YE	2267	I	DLS	Mirror Heating Element Control	2	0.5	BN/YE	2267	V	DLS-EF7-Z49
3	1.5	BN/YE	3385	III	AE3	Power Window Switch Passenger Down Signal	3	1.5	BN/YE	3385	III	AE3
4	1.5	YE/BK	3384	III	AE3	Power Window Switch Passenger Up Signal	4	1.5	YE/BK	3384	III	AE3

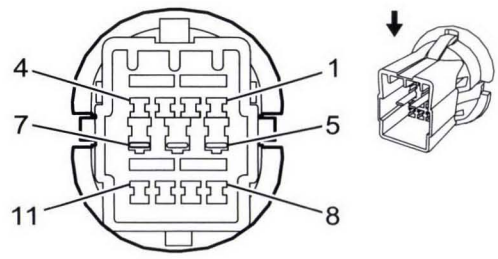
X600 Passenger Door Harness to Body Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
5	0.35	BN/YE	780	I	EF7/Z49	Driver Door Lock Switch Lock Signal	5	0.5	BN/YE	780	V	EF7/Z49
6	0.35	BN/WH	781	I	EF7/Z49	Driver Door Lock Switch Unlock Signal	6	0.5	BN/WH	781	V	EF7/Z49
7	0.35	YE	6817	I	EF7/Z49	LED Backlight Dimming Control	7	0.5	YE	6817	V	EF7/Z49
8	0.5	BN/OG	2134	I	AYF/AW7	Right Front Side Impact Sensing Module Signal	8	0.5	BN/OG	2134	V	(AYF/AW7)
9	0.5	BK/OG	6629	I	AYF/AW7	Right Front Side Impact Sensing Module Low Reference	9	0.5	BK/OG	6629	V	(AYF/AW7)
10	0.5	BK	650	I	(EF7/Z49)-BTM	Ground	10	0.5	BK	650	V	EF7/Z49
11	0.5	GN/VT	1315	I	DLS	Right Front Turn Signal Lamp Control	11	0.5	GN/VT	1315	V	DLS+(EF7/Z49)
12	—	—	—	—	—	Not Occupied	12	—	—	—	—	—
13	0.5	GY	295	I	—	Door Lock Actuator Lock Control	13	0.5	GY	295	V	—
14	0.5	BN/YE	294	I	—	Door Lock Actuator Unlock Control	14	0.5	BN/YE	294	V	—
15	0.5	GN/BK	3396	I	(DLS/D71)	Passenger Mirror Motor Right (+) Left (-) Control	15	0.5	GN/BK	3396	V	—
16	—	—	—	—	—	Not Occupied	16	—	—	—	—	—
17	1.5	VT	1301	III	—	Retained Accessory Power Fuse Control	17	1.5	VT	1301	IV	AE3
18	1	BK	750	II	—	Ground	18	0.5	BK	750	V	DLS+(EF7/Z49)
19	0.5	YE/VT	3397	I	(DLS/D71)	Passenger Mirror Motor Up (+) Down (-) Control	19	0.5	YE/VT	3397	V	(DLS/D71)-EF7-Z49
20	0.5	WH	3398	I	(DLS/D71)	Passenger Mirror Motor Common Control	20	0.5	WH	3398	V	(DLS/D71)-EF7-Z49
21 - 30	—	—	—	—	—	Not Occupied	21 - 30	-	—	—	—	—

X700 Left Rear Door Harness to Body Harness



2268720



2268734

Connector Part Information

Harness Type: Body
OEM Connector: 1897699-5
Service Connector: 13584406
Description: 11-Way F

Connector Part Information

Harness Type: Left Rear Door
OEM Connector: 3-85216-5
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 11-Way M 070 Series, Sealed

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13587564	J-35616-33 (YE)	J-38125-553	172773-1	15	A	D
II	13580003	J-35616-33 (YE)	J-38125-553	173630-7	8	E	4
III	Not Required	J-35616-34 (YE)	No Tool Required	Not Required	Not Required	Not Required	Not Required
IV	Not Required	J-35616-33 (YE)	No Tool Required	Not Required	Not Required	Not Required	Not Required

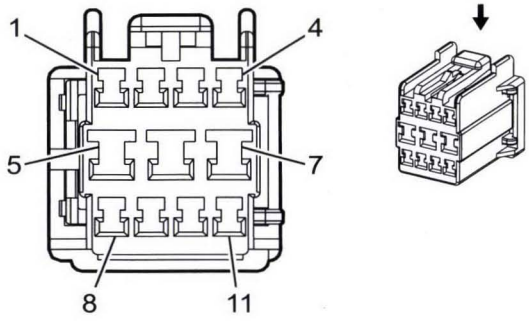
X700 Left Rear Door Harness to Body Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	GY	295	II	—	Door Lock Actuator Lock Control	1	0.5	GY	295	III	—
2	—	—	—	—	—	Not Occupied	2	—	—	—	—	—
3	0.5	BN/YE	294	II	—	Door Lock Actuator Unlock Control	3	0.5	BN/YE	294	III	—
4	—	—	—	—	—	Not Occupied	4	—	—	—	—	—
5	1.5	BU/WH	1307	I	AE3	Power Window Master Switch Lockout Signal	5	1.5	BU/WH	1307	IV	AE3

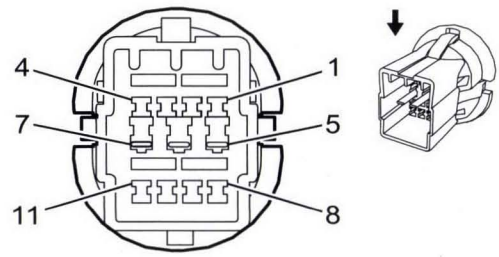
X700 Left Rear Door Harness to Body Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
6	1.5	GN/ GY	1185	I	AE3	Power Window Switch Left Rear Up Signal	6	1.5	GN/ GY	1185	IV	AE3
7	1.5	BN/ BU	1187	I	AE3	Power Window Switch Left Rear Down Signal	7	1.5	BN/ BU	1187	IV	AE3
8 - 11	—	—	—	—	—	Not Occupied	8 - 11	-	—	—	—	—

X800 Right Rear Door Harness to Body Harness



2268720



2268734

Connector Part Information

Harness Type: Body
OEM Connector: 1897699-5
Service Connector: 13584406
Description: 11-Way F

Connector Part Information

Harness Type: Right Rear Door
OEM Connector: 3-85216-5
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 11-Way M 070 Series, Sealed

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	N/A	J-35616-33 (YE)	J-38125-553	Not Required	Not Required	Not Required	Not Required
II	N/A	J-35616-33 (YE)	J-38125-553	Not Required	Not Required	Not Required	Not Required
III	Not Required	J-35616-34 (YE)	No Tool Required	Not Required	Not Required	Not Required	Not Required
IV	Not Required	J-35616-34 (YE)	No Tool Required	Not Required	Not Required	Not Required	Not Required

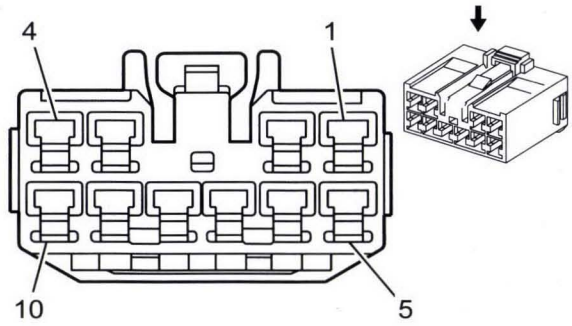
X800 Right Rear Door Harness to Body Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	0.5	GY	295	II	—	Door Lock Actuator Lock Control	1	0.5	GY	295	III	—
2	—	—	—	—	—	Not Occupied	2	—	—	—	—	—
3	0.5	BN/YE	294	II	—	Door Lock Actuator Unlock Control	3	0.5	BN/YE	294	III	—
4	—	—	—	—	—	Not Occupied	4	—	—	—	—	—
5	1.5	BU/WH	1307	I	AE3	Power Window Master Switch Lockout Signal	5	1.5	BU/WH	1307	IV	AE3

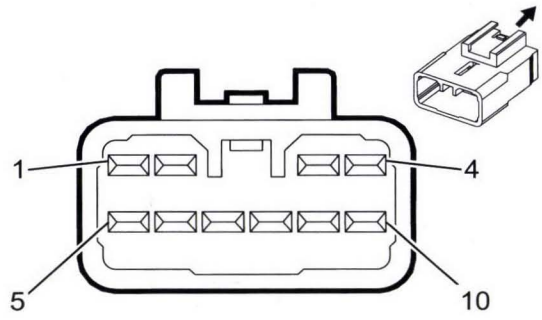
X800 Right Rear Door Harness to Body Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
6	1.5	GN/ GY	1186	I	AE3	Power Window Switch Right Rear Up Signal	6	1.5	GN/ GY	1186	IV	AE3
7	1.5	BN/ BU	1188	I	AE3	Power Window Switch Right Rear Down Signal	7	1.5	BN/ BU	1188	IV	AE3
8 - 11	—	—	—	—	—	Not Occupied	8 - 11	-	—	—	—	—

X900 Liftgate Harness to Body Harness



3997031



2268772

Connector Part Information

Harness Type: Liftgate

OEM Connector: MG651056

Service Connector: Service by Harness Assembly- See Part Catalog

Description: 10-Way F 090 II Series (NA)

Connector Part Information

Harness Type: Body

OEM Connector: MG641059

Service Connector: 13584404

Description: 10-Way M 090 Series (NA)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-18 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-18 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required
III	Not Required	J-35616-18 (BK)	No Tool Required	Not Required	Not Required	Not Required	Not Required
IV	13575606	J-35616-19 (BK)	J-38125-553	7114-4020	22	E	C
V	13575606	J-35616-19 (BK)	J-38125-553	7114-4021	23	2	A
VI	13584575	J-35616-19 (BK)	J-38125-553	Not Available	Not Avail-able	Not Avail-able	Not Avail-able

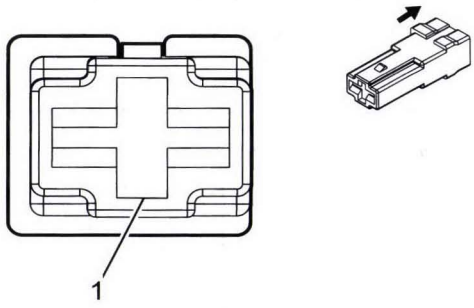
X900 Liftgate Harness to Body Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	2	BN/ VT	293	III	—	Rear Defog Element Control	1	2	BN/ VT	293	VI	—
2	0.5	VT/ WH	5065	I	TT9	Stop Lamp Relay Coil Control	2	0.5	VT/ WH	5065	IV	—
3	0.5	GN/ YE	6846	I	EF7/Z49	Rear License Lamp Control	3	0.5	GN/ YE	6846	IV	—
4	0.5	VT/ GY	1303	I	—	Lift Gate Ajar Switch Signal (1)	4	0.35	VT/ GY	1303	IV	—
5	0.5	GY	295	I	A91	Door Lock Actuator Lock Control	5	0.5	GY	295	IV	—

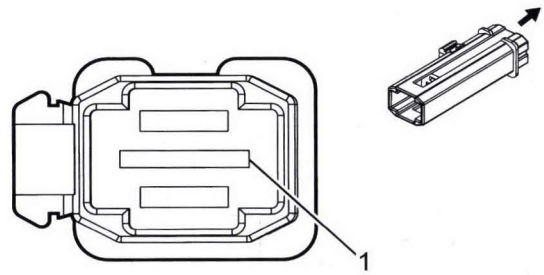
X900 Liftgate Harness to Body Harness (cont'd)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
6	0.5	BN/ YE	294	I	A91	Door Lock Actuator Unlock Control	6	0.5	BN/ YE	294	IV	—
7	1	BU	393	II	CD6	Rear Window Wiper Motor Control	7	1	BU	393	V	CD6
8	1	RD/ VT	1640	II	CD6	Battery Positive Voltage	8	1	RD/ VT	1640	V	CD6
9	0.5	BK	1250	I	UVC	Ground	9	0.5	BK	1250	IV	—
10	2	BK	1150	III	—	Ground	10	2	BK	1150	VI	—

X902 Liftgate Extention Harness to Liftgate Harness



2812431



2812429

Connector Part Information

Harness Type: Liftgate Extension
OEM Connector: 929029-1
Service Connector: Service by Harness - See Part Catalog
Description: 1-Way F (BK)

Connector Part Information

Harness Type: Liftgate
OEM Connector: 929030-1
Service Connector: Service by Harness Assembly- See Part Catalog
Description: 1-Way M (BK)

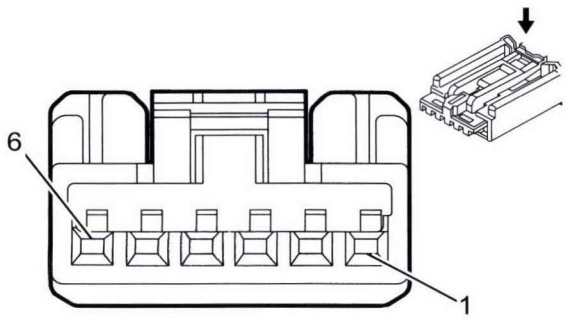
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	Not Required	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-42 (RD)	No Tool Required	Not Required	Not Required	Not Required	Not Required

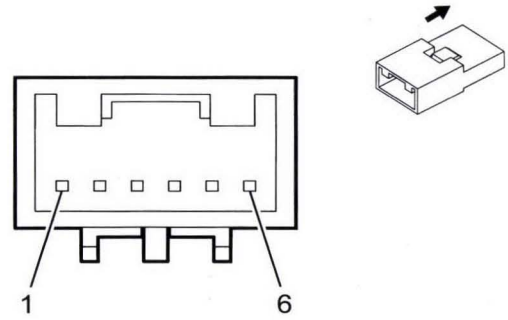
X902 Liftgate Extention Harness to Liftgate Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	2	BK	1150	I	—	Ground	1	2	BK	1150	II	—

X905 Body Harness to Tailgate Harness (UVC)



1862240



2839920

Connector Part Information

Harness Type: Liftgate
OEM Connector: AIT2PB-06-1AK
Service Connector: Service by Harness - See Part Catalog
Description: 6-Way F 0.64 Kaizen Series (BK)

Connector Part Information

Harness Type: Body
OEM Connector: AIT2WSB-06-1AK
Service Connector: 19299681
Description: 6-Way M 0.64 Kaizen Series (BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	Not Required	J-35616-64B (LT BU)	No Tool Required	Not Required	Not Required	Not Required	Not Required
II	Not Required	J-35616-65B (LT BU)	Not Required	Not Required	Not Required	Not Required	Not Required

X905 Body Harness to Tailgate Harness (UVC)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	—	—	—	—	—	Not Occupied	1	—	—	—	—	—
2	0.5	BK/WH	651	I	UVC	Signal Ground	2	0.35	BK/WH	651	II	UVC
3	0.5	GY/YE	6972	I	UVC	Camera Signal 2 +	3	0.35	GY/YE	6972	II	UVC
4	0.5	WH/BU	6973	I	UVC	Camera Signal 2	4	0.35	WH/BU	6973	II	UVC
5	0.5	GN/WH	24	I	UVC	Backup Lamp Control	5	0.35	GN/WH	24	II	UVC
6	0.5	VT/BN	841	I	UVC	Run Ignition 3 Voltage	6	0.35	VT/BN	841	II	UVC

Diagnostic Information and Procedures

DTC B097B

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B097B: Power Mode Start Switch Circuit

For symptom byte information refer to *Symptom Byte List on page 6-117*

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal – Terminal 3	B097B 02*	B097B 05*	B097B 05*	—
Signal – Terminal 6	B097B 02	B097B 04	B097B 04	—
Low Reference	—	B097B 05*	—	—
Ground	—	B097B 04	—	—
* DTC set in keyless entry control module				

Circuit/System Description

The vehicle ON/OFF switch has a single LED that indicate the vehicle power mode. When the vehicle is in the off mode, the LED is not illuminated. Pressing and holding the vehicle ON/OFF switch up to 10 s, without the brake pedal applied will enter the Vehicle Service Mode and the LED will illuminate. With the vehicle OFF and the brake pedal applied, pressing the vehicle ON/OFF switch once will enter Vehicle ON mode and the LED will illuminate.

The vehicle ON/OFF switch contains two individual switches that provide redundant inputs to both the body control module (BCM) and the keyless entry control module. The BCM supplies the vehicle ON/OFF switch a constant B+ signal. The BCM monitors this signal to determine if the switch is released or pressed. When the vehicle ON/OFF switch is not pressed, voltage on the signal circuit is pulled down through two resistors in the switch. When the vehicle ON/OFF switch is pressed, voltage on the signal circuit is pulled down through only one resistor, changing the voltage seen at the BCM and indicating that the vehicle ON/OFF switch is pressed.

The keyless entry control module monitors voltage on the switch in the same manner as the BCM. The keyless entry control module also controls the backup power for the ignition main relay 1 through the control circuit by applying voltage to the ignition voltage circuit. This circuit is a pass-thru in the BCM and will energize the ignition circuit when the vehicle is in Service Mode, the vehicle is ON, or when a remote start is requested.

Conditions for Running the DTC

Control module voltage is 9–16 V.

Conditions for Setting the DTC

B097B 00

- The voltage seen at the BCM monitored switch does not match the voltage seen at the keyless entry control module monitored switch.
- The above condition exists for more than 1 s

B097B 02

- The control module detects a short to ground in the vehicle ON/OFF switch signal circuit
- The above condition exists for more than 1 s

B097B 04

- The control module detects an open in the vehicle ON/OFF switch signal circuit
- The above condition exists for more than 1 s

B097B 05

- The control module detects an open in the vehicle ON/OFF switch signal circuit
- The above condition exists for more than 1 s

B097B 08

- The control module detects a change in the ignition mode without observing a switch press
- The above condition occurs 4 consecutive times

B097B 61

- The control module detects a continuously closed vehicle ON/OFF switch
- The above condition exists for more than 1 min

Action Taken When the DTC Sets

No action is taken.

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears after 40 consecutive module ignition cycles without a repeat of the malfunction.

Reference Information

Schematic Reference

- *Power Distribution Schematics on page 11-314*
- *Power Moding Schematics on page 11-327*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

- *Power Mode Description and Operation on page 11-958*
- *Keyless Entry System Description and Operation on page 12-79*

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify DTC B097B 08 or B097B 61 is not set.

⇒ **If either DTC is set**

Test or replace the S83 Vehicle On/Off Switch.

⇓ **If the DTCs are not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S83 Vehicle On/Off Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.

⇒ **If 10 Ω or greater**

2.1. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Test for less than 10 Ω between the low reference circuit terminal 7 and ground.

⇒ **If 10 Ω or greater**

3.1. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K84 Keyless Entry Control Module.

⇓ **If less than 10 Ω**

4. Connect the S83 Vehicle On/Off Switch, Vehicle in Service Mode.
5. Disconnect the S83 Vehicle On/Off Switch.
6. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is greater than 11 V.

⇒ **If 11 V or less**

6.1. Connect the S83 Vehicle On/Off Switch.

6.2. Vehicle OFF, disconnect the X2 harness connector at the K9 Body Control Module.

6.3. Test for infinite resistance between the signal circuit terminal 6 and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K9 Body Control Module.

⇓ **If greater than 11 V**

7. Install a 3 A fused jumper wire between the signal circuit terminal 6 and ground.
8. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is less than 1 V.

⇒ **If 1 V or greater**

8.1. Disconnect the harness connector at the K9 Body Control Module.

8.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇓ If less than 1 V

8.3. Test for less than 2 Ω in signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If less than 1 V**

9. Connect the harness connector at the S83 Vehicle On/Off Switch.

10. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is 8–10 V, with the S83 Vehicle On/Off Switch released.

⇒ **If not between 8–10 V**

Test or replace the S83 Vehicle On/Off Switch.

⇓ **If between 8–10 V**

11. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is 4–7 V, with the S83 Vehicle On/Off Switch pressed.

⇒ **If not between 4–7 V**

Test or replace the S83 Vehicle On/Off Switch.

⇓ **If between 4–7 V**

12. Disconnect the X1 harness connector at the K84 Keyless Entry Control Module.
13. Test for infinite resistance between the signal circuit terminal 11 and ground.

⇒ **If less than infinite resistance**

Repair the short to ground on the circuit.

⇓ **If infinite resistance**

14. Vehicle in Service Mode.
15. Test for less than 1 V between the signal circuit terminal 11 and ground.

⇒ **If 1 V or greater**

Repair the short to voltage on the circuit.

⇓ **If less than 1 V**

16. Test for 4.5–5.5 k Ω between the signal circuit terminal 11 and the low reference circuit terminal 12, with the S83 Vehicle On/Off Switch released.

⇒ **If not between 4.5–5.5 k Ω**

16.1. Vehicle OFF, disconnect the harness connector at the S83 Vehicle On/Off Switch.

16.2. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, test or replace the S83 Vehicle On/Off Switch.

⇓ **If between 4.5–5.5 k Ω**

17. Test for 1–1.5 k Ω between the signal circuit terminal 11 and the low reference circuit terminal 12, with the S83 Vehicle On/Off Switch pressed.

⇒ **If not between 1–1.5 k Ω**

Test or replace the S83 Vehicle On/Off Switch.

⇓ **If between 1–1.5 k Ω**

18. Replace the K84 Keyless Entry Control Module.

Component Testing

vehicle ON/OFF Switch

1. Vehicle OFF, disconnect the harness connector at the S83 Vehicle ON/OFF Switch.
2. Test for 4.5–5.5 k Ω between the terminal listed below with the S83 Vehicle ON/OFF Switch released:
   - Signal terminal 6 and ground terminal 4
   - Signal terminal 3 and low reference terminal 7

⇒ **If not between 4.5–5.5 k Ω**

Replace the S83 Vehicle On/Off Switch.

⇓ **If between 4.5–5.5 k Ω**

3. Test for 1–1.5k Ω between the terminals listed below with the S83 Vehicle On/Off Switch pressed, :
   - Signal terminal 6 and ground terminal 4
   - Signal terminal 3 and low reference terminal 7

⇒ **If not between 1–1.5 k Ω**

Replace the S83 Vehicle On/Off Switch.

⇓ **If between 1–1.5 k Ω**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Ignition and Start Switch Replacement on page 11-957*
- *Control Module References on page 6-3* for the appropriate control module replacement, programming and setup.

DTC B1370 (Instrument Cluster)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B1370 01: Control Module Ignition On and Start Circuit Short to Battery
DTC B1370 06: Control Module Ignition On and Start Circuit Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Instrument Cluster Ignition (Instrument Panel Cluster terminal 31)	B1370 06	B1370 06	B1370 01	—

Circuit/System Description

The vehicle power mode master is the body control module (BCM). The BCM monitors switch inputs and will activate relays and other direct outputs of the power mode master as needed according to the calculated power mode.

The instrument cluster has a switched voltage input and may operate in a default mode if the power mode master serial data message does not match what the individual module can see from its own connections.

Conditions for Running the DTC

B1370 01

Vehicle ON.

B1370 06

Vehicle ON, or Vehicle in Service Mode.

Conditions for Setting the DTC

B1370 01

Ignition circuit is shorted to voltage.

B1370 06

- Ignition circuit is open.
- Ignition circuit is shorted to ground.

Action Taken When the DTC Sets

The Instrument Cluster still functions except the malfunction indicator light is always off.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 50 consecutive malfunction-free Vehicle On/Off cycles have occurred.

Reference Information

Schematic Reference

- *Instrument Cluster Schematics on page 8-77*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

- *Instrument Cluster Description and Operation on page 8-101*
- *Power Mode Description and Operation on page 11-958*

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify that DTC B144B is not set.

⇒ **If DTC B144B is set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If DTC B144B is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Vehicle OFF, disconnect the harness connector at the P16 Instrument Cluster.
2. Verify that a test lamp does not illuminate between the ignition circuit terminal 31 and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

⇓ **If the test lamp does not illuminate**

3. Vehicle in Service Mode.
4. Verify that a test lamp illuminates between the ignition terminal 31 and ground.

⇒ **If the test lamp does not illuminate and the Ignition fuse is good**

4.1. Vehicle OFF, remove the test lamp.

4.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, refer to *Power Mode Mismatch on page 11-857*.

⇒ **If the test lamp does not illuminate and the Ignition fuse is open**

4.1. Vehicle OFF, remove the test lamp.

4.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the P16 Instrument Cluster.

⇓ **If the test lamp illuminates**

5. Replace the P16 Instrument Cluster.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Control Module References on page 6-3* for control module replacement, programming and setup.

DTC B1370-B1379, B1380-B1389, or B1440-B1443

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B1370 : Control Module Ignition ON and Start Circuit
DTC B1380 : Control Module Ignition Accessory Circuit
DTC B1441 : Control Module Ignition OFF, Run, and Start Circuit

For symptom byte information refer to *Symptom Byte List on page 6-117*

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+ terminal 5	B1370 04, B1380 04	B1370 04, B1380 04	—	—
Ignition Terminal 4	B1370 04, B1380 04	B1370 04, B1380 04	B1370 01	—
Ignition Terminal 6	B1370 04, B1380 04	B1380 04	B1380 01	—
Ignition Terminal 3	B1370 04, B1380 04, B1441 04	B1441 04	B1441 04	—
5 V Reference terminal 2	—	1	—	—
1. Power Mode Mismatch				

Circuit/System Description

The vehicle power mode master is the body control module (BCM). The ignition switch is a low current switch with multiple discrete circuits to the BCM. The BCM logic uses the ignition switch positions to identify the operator's desired power mode and activate specific discrete signals, and serial data messages for the operation of different subsystems as necessary. Other modules which have switched voltage inputs may operate in a default mode if the power mode master serial data message does not match what the individual module can detect from its own connections.

The power mode master will activate relays and other direct outputs of the power mode master as needed according to the calculated power mode. Some relays controlled by the BCM are switched ignition voltage outputs that are pass through circuits within the BCM directly from the ignition switch. If these circuits short to ground, the B+ circuit fuse to the ignition switch will open.

Conditions for Running the DTC

B1370 01, B1370 04

Ignition switch is in the RUN or CRANK positions.

B1380 01, B1380 04

Ignition switch is in the RUN or ACCESSORY positions.

B1441 01, B1441 04

Ignition switch is in the CRANK position.

Conditions for Setting the DTC

B1370 01

Ignition circuit is shorted to voltage.

B1370 04

- Ignition circuit is open.
- Ignition, accessory, or off/run/crank circuit shorted to ground.
- B+ circuit of the ignition switch is open or shorted to ground.
- Ignition relay control circuit open, including relay coil and ground.

B1380 01

Ignition, accessory circuit is shorted to voltage.

B1380 04

- Ignition, accessory circuit is open.
- Ignition, accessory, or off/run/crank circuit shorted to ground.
- B+ circuit of the ignition switch is open or shorted to ground.

B1441 01

Ignition, off/run/crank signal circuit is shorted to voltage.

B1441 04

Ignition, off/run/crank signal circuit is open.

Actions Taken When the DTC Sets

- The BCM operates in a fail-safe power mode dependent on the last valid power mode detected.
- The other modules on the vehicle operate in a fail-safe power mode dependent on the last valid power mode transmitted by the BCM.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 50 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

Power Distribution Schematics on page 11-314

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify DTC U1814 is not set.

⇒ **If DTC is set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If DTC is not set**

3. Verify the scan tool power mode parameters change when cycling the S39 Ignition Switch between OFF and ON.

⇒ **If the power mode parameters do not change**

Refer to Circuit/System Testing.

⇓ **If the power mode parameters change**

4. All OK.

Circuit/System Testing

1. Vehicle OFF, disconnect the harness connector at the S39 Ignition Switch.
2. Verify a test lamp illuminates between the B+ circuit terminal 5 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

2.1. Remove the test lamp.

2.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is good and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

2.1. Remove the test lamp.

2.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on one of the following circuits listed below:

Note: To help isolate a short to ground, it may be necessary to disconnect modules that are connected to the following circuits:

- B+ circuit terminal 5
- Ignition circuit terminal 3
- Ignition circuit terminal 4
- Ignition circuit terminal 6

⇓ **If the test lamp illuminates**

3. Connect the S39 Ignition Switch.
4. Vehicle in Service Mode, disconnect the harness connector at the S39 Ignition Switch while in Vehicle in Service Mode.
5. Test for 4.8–5.2 V between the 5 V reference circuit terminal 2 and ground.

⇒ **If less than 4.8 V**

5.1. Connect the S39 Ignition Switch.

5.2. Vehicle OFF, disconnect the X3 harness connector at the K9 Body Control Module and the S39 Ignition Switch.

5.3. Test for infinite resistance between the 5 V reference circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

5.4. Test for less than 2 Ω in the 5 V reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If greater than 5.2 V**

5.1. Connect the S39 Ignition Switch.

5.2. Vehicle OFF, disconnect the X3 harness connector at the K9 Body Control Module.

5.3. Vehicle In Service Mode, disconnect the harness connector at the S39 Ignition Switch while in Vehicle in Service Mode.

5.4. Test for less than 1 V between the 5 V reference circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If between 4.8–5.2 V**

6. Connect the S39 Ignition Switch.
7. Vehicle OFF.
8. Disconnect the X3 harness connector at the K9 Body Control Module, Vehicle in Service Mode.
9. Verify a test lamp illuminates between each of the ignition circuits listed below and ground:
   - Ignition circuit terminal 5
   - Ignition circuit terminal 6

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

9.1. Vehicle OFF remove the test lamp.

9.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is good and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

9.1. Vehicle OFF remove the test lamp.

9.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

10. Vehicle OFF with the key in.
11. Verify a test lamp illuminates between ignition circuit terminal 15 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

11.1. Vehicle OFF with the key out, remove the test lamp.

11.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is good and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

11.1. Vehicle OFF with the key out remove the test lamp.

11.2. Test for infinite resistance between the ignition circuit terminal 15 and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

12. Connect the X3 harness connector at the K9 Body Control Module, Vehicle in Service Mode.
13. Disconnect the harness connector at the S39 Ignition Switch.
14. Test for less than 1 V between each of the ignition circuits listed below and ground.
    - Ignition circuit terminal 3
    - Ignition circuit terminal 4
    - Ignition circuit terminal 6

⇒ **If 1 V or greater**

Repair the short to voltage on the circuit.

⇓ **If less than 1 V**

15. Test or replace the S39 Ignition Switch.

Component Testing

1. Vehicle OFF, disconnect the harness connector at the S39 Ignition Switch.
2. Using the Resistance Test below, verify the resistance between the terminals listed below match for each S39 Ignition Switch position.

⇒ **If any reading is other than specified**

Replace the S39 Ignition Switch.

⇓ **If the readings match**

3. All OK.

Resistance Test

Ignition Switch Position	Terminals 2 and 3	Terminals 2 and 5	Terminals 3 and 5	Terminals 4 and 5	Terminals 5 and 6
OFF Key Out	Infinite	Infinite	Infinite	Infinite	Infinite
OFF Key In	Infinite	Infinite	<5.0 Ω	Infinite	Infinite
Accessory	Infinite	Infinite	Infinite	Infinite	<5.0 Ω
Run	<5.0 Ω	Infinite	Infinite	<5.0 Ω	<5.0 Ω

Resistance Test (cont'd)

Ignition Switch Position	Terminals 2 and 3	Terminals 2 and 5	Terminals 3 and 5	Terminals 4 and 5	Terminals 5 and 6
Start	1275–1325 Ω	Infinite	Infinite	<5.0 Ω	Infinite

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Ignition and Start Switch Replacement on page 11-957*
- *Control Module References on page 6-3* for the appropriate control module replacement, programming and setup.

DTC B1445

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B1445: Control Module Voltage Output Circuit

For symptom byte information refer to *Symptom Byte List on page 6-117*

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Coil Control	B1445 02	1	1	—
1. Retained accessory power malfunction				

Circuit/System Description

The body control module (BCM) controls the retained accessory power relay through the control circuit by applying voltage to the retained accessory power relay coil control circuit. The retained accessory power relay is energized when the vehicle is in Vehicle in Service Mode or Vehicle ON mode.

Conditions for Running the DTC

- The system voltage is between 9–16 V.

Conditions for Setting the DTC

The DTC will set only when the module requests the output and there is a short to ground in the ignition voltage circuit.

Action Taken When the DTC Sets

The module output driver will be shut down and not supply voltage to the circuit.

Conditions for Clearing the DTC

- The current DTC will clear when the malfunction is no longer present.
- A history DTC clears when the module ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Reference Information

Schematic Reference

Power Distribution Schematics on page 11-314

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Retained Accessory Power Description and Operation on page 11-962

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify the KR76 Retained Accessory Power Relay clicks ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.

⇒ **If the KR76 Retained Accessory Power Relay does not click ON and OFF**

Refer to Circuit/System Testing.

⇓ **If the KR76 Retained Accessory Power Relay clicks ON and OFF**

3. All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR76 Retained Accessory Power Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 86 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode, connect a test lamp between the control circuit terminal 85 and ground circuit terminal 86.
4. Verify the test lamp turns ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.

⇒ **If the test lamp is always OFF**

4.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

4.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

4.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

4.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

4.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

5. Test or replace the KR76 Retained Accessory Power Relay.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Relay Replacement (Within an Electrical Center) on page 11-953* or *Relay Replacement (Attached to Wire Harness) on page 11-953*
- *Control Module References on page 6-3* for body control module replacement, programming and setup.

DTC B144A

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B144A : RUN Power Relay Circuit

For symptom byte information refer to *Symptom Byte List on page 6-117*

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Coil Control	B144A 02	—	—	—

Circuit/System Description

The body control module (BCM) controls the ignition run relay through the control circuit by applying voltage to the run relay coil control circuit. The ignition run relay is energized when the vehicle is in Service Mode or Vehicle ON mode.

Conditions for Running the DTC

- The system voltage is between 9–16 V.
- The DTC can only run when the output is activated.

Conditions for Setting the DTC

The BCM detects a short to ground in the ignition run relay control circuit.

Action Taken When the DTC Sets

The module output driver will be shut down and not supply voltage to the ignition run relay control circuit.

Conditions for Clearing the DTC

- The current DTC will clear when the module request for the output is removed or the malfunction is no longer present.
- A history DTC clears when the module ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

Short to voltage in the ignition run relay control circuit will cause the heated seats and the HVAC blower motor to remain ON with the vehicle OFF.

Reference Information

Schematic Reference

Power Moding Schematics on page 11-327

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify the KR74 Ignition Run Relay clicks ON and OFF when changing from Vehicle in Service Mode to Vehicle OFF

⇒ **If the KR74 Ignition Run Relay does not click ON and OFF**

Refer to Circuit/System Testing

⇓ **If the KR74 Ignition Run Relay clicks ON and OFF**

3. All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR74 Ignition Run Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode, connect a test lamp between the control circuit terminal 86 and ground circuit terminal 85.
4. Verify the test lamp turns ON and OFF when changing from Vehicle in Service Mode to Vehicle OFF

⇒ **If the test lamp is always OFF**

4.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

4.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

4.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

4.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

4.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

5. Test or replace the KR74 Ignition Run Relay .

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Relay Replacement (Within an Electrical Center) on page 11-953* or *Relay Replacement (Attached to Wire Harness) on page 11-953*
- *Control Module References on page 6-3* for body control module replacement, programming and setup.

DTC B144B

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B144B: Run/Crank Power Relay Circuit

For symptom byte information refer to *Symptom Byte List on page 6-117*

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	B144B 02*	B144B 04*	B144B 01*	—
Control	B144B 02**	—	—	—

* DTC set in keyless entry control module
** DTC set in BCM

Circuit/System Description

The body control module (BCM) controls the ignition main relay 1 through the control circuit by applying voltage to the ignition run/crank relay coil control circuit. The ignition main relay 1 is energized when the vehicle is in Service Mode, the vehicle is ON, or when a remote start is requested. This is part of the BCM's primary function in controlling the vehicle power mode.

The keyless entry control module controls the backup power for the ignition main relay 1 through the control circuit by applying voltage to the ignition circuit. This circuit is a pass-thru in the BCM and will energize the ignition circuit when the vehicle is in Service Mode, the vehicle is ON, or when a remote start is requested.

Conditions for Running the DTC

System voltage is greater than 9 V

Conditions for Setting the DTC

B144B 01

The ignition output is not active and a short to battery is detected 3 consecutive times on the ignition voltage circuit

B144B 02 – BCM

A short to ground is detected on the ignition run/crank relay coil control circuit

B144B 02 – Keyless Entry Control Module

The ignition output is active and a short to ground is detected 3 consecutive times on the ignition voltage circuit

B144B 04

The ignition output is not active and an open is detected 20 consecutive times on the ignition voltage circuit

Action Taken When the DTC Sets

B144B 01, B144B 04

No action is taken

B144B 02

The ignition main relay 1 is deactivated when the fault is set. After 100 ms, the ignition main relay 1 will be activated. If the fault is still set, the relay will be deactivated. The ignition main relay 1 will again be activated after 100 ms. If this also results in a fault, the ignition main relay 1 will be deactivated until a new ignition request is received.

Conditions for Clearing the DTC

- The current DTC will clear when the malfunction is no longer present and an ignition request is received.
- A history DTC will clear after 40 malfunction-free ignition cycles.

Reference Information

Schematic Reference

Power Moding Schematics on page 11-327

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify the KR73A Ignition Main Relay 1 clicks ON and OFF when commanding the Run/Crank relay On and Off with a scan tool.

⇒ **If the KR73A Ignition Main Relay 1 does not click ON and OFF**

Refer to Circuit/System Testing.

⇓ **If the KR73A Ignition Main Relay 1 clicks ON and OFF**

3. All OK.

Circuit/System Testing

Without BTM

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR73A Ignition Main Relay 1. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode, connect a test lamp between the control circuit terminal 86 and ground circuit terminal 85.
4. Verify the test lamp turns ON and OFF when commanding the Run/Crank relay On and Off with a scan tool.

⇒ **If the test lamp is always OFF**

4.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

4.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

4.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

4.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

4.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

5. Test or replace the KR73A Ignition Main Relay 1 .

With BTM

1. Vehicle in Service Mode, disconnect the X2 harness connector at the K84 Keyless Entry Control Module.
2. Verify that a test lamp illuminates between the B+ circuit terminal 1 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

2.1. Vehicle OFF, remove the test lamp.

2.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is good and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

2.1. Vehicle OFF, remove the test lamp.

2.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K84 Keyless Entry Control Module.

⇓ **If the test lamp illuminates**

3. Vehicle OFF, connect the X2 harness connector at the K84 Keyless Entry Control Module and disconnect the X3 harness connector at the K9 Body Control Module.
4. Test for less than 1 V between the ignition circuit terminal 6 and ground.

⇒ **If 1 V or greater**

Repair the short to voltage on the circuit.

⇓ **If less than 1 V**

5. Vehicle in Service Mode.
6. Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.

⇒ **If the test lamp does not illuminate**

6.1. Vehicle OFF, remove the test lamp.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance.

6.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K84 Keyless Entry Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle OFF, remove the test lamp, connect the X3 harness connector at the K9 Body Control Module.
8. Vehicle OFF and all vehicle systems OFF, disconnect the KR73A Ignition Main Relay 1. It may take up to 2 min for all vehicle systems to power down.
9. Test for less than 10 Ω between the ground circuit terminal 85 and ground.

⇒ **If 10 Ω or greater**

9.1. Vehicle OFF.

9.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

10. Connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 85.
11. Verify the test lamp turns ON and OFF when commanding the Run/Crank relay On and Off with a scan tool.

⇒ **If the test lamp is always OFF**

11.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.

11.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance.

11.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

11.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

11.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

12. Test or replace the KR73A Ignition Main Relay 1.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Relay Replacement (Within an Electrical Center) on page 11-953* or *Relay Replacement (Attached to Wire Harness) on page 11-953*
- *Control Module References on page 6-3* for body control module or keyless entry control module replacement, programming and setup.

DTC B1451

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B1451 : Accessory Power Circuit

For symptom byte information refer to *Symptom Byte List on page 6-117*

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	B1451 02	B1451 04	B1451 01	—

Circuit/System Description

The keyless entry control module provides backup controls for the ignition power circuit, through the control circuit, by applying voltage to the circuit. The ignition power circuit is energized when the vehicle power mode is in Vehicle ON or Vehicle in Service Mode.

Conditions for Running the DTC

B1451 01, B1451 04

- Vehicle power mode is Vehicle OFF
- Module is awake
- DTC B1451 not already set
- System voltage between 6 and 16 V

B1451 02

- Vehicle power mode is Vehicle ON or Vehicle in Service Mode
- Module is awake
- The DTC is only run when the output is active
- DTC B1451 is not already set
- System voltage between 6 and 16 V

Conditions for Setting the DTC

B1451 01

Ignition output is not active and a short to battery is detected 3 consecutive times.

B1451 02

Ignition output is active and a short to ground is detected 3 consecutive times.

B1451 04

Ignition output is not active and an open circuit is detected 20 consecutive times.

Action Taken When the DTC Sets

B1451 02

The ignition output is deactivated when a short to ground is detected. After 100 ms the output is activated again. This happens 3 times and then the output is deactivated until a new Vehicle ON or Vehicle in Service Mode request is received.

B1451 01, B1451 04

No action is taken.

Conditions for Clearing the DTC

- The current DTC will clear when the malfunction is no longer present during a DTC check.
- A history DTC clears when the module power mode cycle counter reaches the reset threshold of 40, without a repeat of the malfunction.

Diagnostic Aids

- A short to voltage in the ignition control circuit will keep the vehicle modules awake, which can drain the vehicle's battery.
- A short to ground in the extension of this circuit through the body control module can back feed to the keyless entry control module. Check for a short to ground on the ignition circuit on the other side of the ignition pass thru, in the body control module, before replacing the body control module.

Reference Information

Schematic Reference

Power Moding Schematics on page 11-327

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify DTC U1814 is not set.

⇒ **If DTC U1814 is set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If DTC U1814 is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Vehicle in Service Mode, disconnect the X2 harness connector at the K84 Keyless Entry Control Module.
2. Verify that a test lamp illuminates between B+ circuit terminal 5 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

2.1. Vehicle OFF, remove the test lamp.

2.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

2.1. Vehicle OFF, remove the test lamp.

2.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K84 Keyless Entry Control Module.

⇓ **If the test lamp illuminates**

3. Vehicle OFF, connect the X2 harness connector at the K84 Keyless Entry Control Module and disconnect the X3 harness connector at the K9 Body Control Module.
4. Test for less than 1 V between the ignition circuit terminal 5 and ground.

⇒ **If 1 V or greater**

Repair the short to voltage on the circuit.

⇓ **If less than 1 V**

5. Vehicle in Service Mode.
6. Verify a test lamp illuminates between the ignition circuit terminal 5 and ground.

⇒ **If the test lamp does not illuminate**

6.1. Vehicle OFF. remove the test lamp.

6.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance.

6.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K84 Keyless Entry Control Module.

⇓ **If the test lamp illuminates**

7. Replace the K9 Body Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for the body control module and keyless entry control module replacement, programming and setup.

DTC B147E or B147F

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B147E: Battery Saver Relay Set Secondary Circuit

DTC B147F: Battery Saver Relay Reset Secondary Circuit

For symptom byte information refer to *Symptom Byte List on page 6-117*

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
F2DA (BCM 2) fuse B+	B147E 04, B147E 07	B147E 04, B147E 07	—	—
Set relay coil control	B147E 02	B147E 04	B147E 01	—
Reset relay coil control	B147F 02	B147F 04	B147F 01	—

Circuit/System Description

Battery saver mode (transport mode) reduces the parasitic load of some modules during overseas shipment or during vehicle storage conditions. This improves the drain time on the battery (up to 70 days without the battery going dead). When a vehicle is in transport/storage, some features may have reduced functionality while in the battery saver mode, such as disabling the Remote Function Actuator or content theft features. Battery saver mode is initiated by turning on the hazard flashers, applying the brake pedal, and then turning the ignition key to the start position or pushing the power button switch for greater than 15s. The mode is disengaged by repeating the previous process. The DIC (if equipped) will display Transport Mode is On when battery saver mode is enabled and Transport Mode is Off when battery saver mode is disabled. For vehicles not equipped with a DIC, the battery indicator light will constantly flash on the Instrument Cluster when battery saver mode is enabled. This feature can be used as many times as necessary if the vehicle is to be stored for an extended period of time.

Battery saver mode incorporates a latching relay that when enabled disconnects some modules from their ignition power or memory power sources. When battery saver mode is enabled and the vehicle is switched to Vehicle OFF, the BCM sends a momentary command to unlatch the relay disconnecting power up to 1 min after RAP is inactive. Every time the vehicle is switched to Vehicle ON or to Vehicle in Service Mode the BCM will send a momentary command to latch the battery saver relay. This allows the use of all features when in Vehicle ON or Vehicle in Service Mode. The BCM will send another command to unlatch the relay once the vehicle is switched to Vehicle OFF and RAP is inactive.

Conditions for Running the DTC

- The system voltage is between 9–16 V.
- The DTC can only run when the output is activated.

Conditions for Setting the DTC

B147E 04 and B147E 07

A loss of B+ voltage to the BCM.

B147E 01 or B147F 01

The BCM detects short to battery in the battery saver relay set/reset circuits.

B147E 02 or B147F 02

The BCM detects a short to ground in the battery saver relay set/reset circuits.

B147E 04 or B147F 04

The BCM detects an open/high resistance in the battery saver relay set/reset circuits.

Action Taken When the DTC Sets

B147E 01, B147E 04, B147E 07, B147F 01, and B147F 04

No action is taken.

B147E 02 and B147F 02

The module output driver will be shut down and not supply voltage to the battery saver relay set/reset circuits.

Conditions for Clearing the DTC

- The current DTC will clear when the module request for the output is removed or the malfunction is no longer present.
- A history DTC clears when the module ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Reference Information

Schematic Reference

- *Power Moding Schematics on page 11-327*
- *Power Distribution Schematics on page 11-314*
- *Body Control System Schematics on page 11-14*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Relay Replacement (Within an Electrical Center) on page 11-953* or *Relay Replacement (Attached to Wire Harness) on page 11-953*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Enable battery saver mode (transport mode) in the vehicle.
2. Verify the KR104A Battery Saver Relay 1 clicks ON and OFF clicks open and closed when cycling the ignition between vehicle in service mode and vehicle OFF.

⇒ **If the KR104A Battery Saver Relay 1 does not click open and closed**

Refer to Circuit/System Testing.

⇓ **If the KR104A Battery Saver Relay 1 clicks open and closed**

3. All OK.

Circuit/System Testing

1. Vehicle OFF, disconnect the X1 harness connector at the K9 Body Control Module, Vehicle in Service Mode.
2. Verify a test lamp illuminates between the B+ circuit terminal 4 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

2.1. Vehicle OFF, remove the test lamp.

2.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

2.1. Vehicle OFF, remove the test lamp.

2.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance, replace the K9 Body Control Module

⇓ **If the test lamp illuminates**

3. Vehicle OFF, connect the X1 harness connector at the K9 Body Control Module, disconnect the KR104A Battery Saver Relay 1.
4. Test for less than 10 Ω between the ground circuit terminal 6 and ground.

⇒ **If 10 Ω or greater**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

5. Vehicle in Service Mode.
6. Verify a test lamp illuminates between the B+ circuit terminal 3 and ground.

⇒ **If the test lamp does not illuminate**

Replace the X51A Fuse Block - Instrument Panel.

⇓ **If the test lamp illuminates**

7. Enable battery saver mode (transport mode).
8. Vehicle OFF.
9. Connect a test lamp between the control circuit terminal 1 and ground.

10. Verify the test lamp momentarily flashes ON and OFF when turning the ignition to Vehicle In Service Mode.

⇒ **If the test lamp is always OFF**

10.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

10.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

10.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

10.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

10.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

11. Connect a test lamp between the control circuit terminal 2 and ground.

12. Verify the test lamp momentarily flashes ON and OFF after turning the ignition to vehicle OFF.

Note: It may take up to 1 min after the ignition is switched to vehicle OFF and retained accessory power is disabled before the K9 Body Control Module sends a command to unlatch the relay.

⇒ **If the test lamp is always OFF**

12.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

12.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

12.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

12.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

12.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

13. Verify that a test lamp does not illuminate between the ignition circuit terminal 5 and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit

⇓ **If the test lamp does not illuminate**

14. Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 3 and the ignition circuit terminal 5.

15. Verify device is activated.

⇒ **If the device is not activated**

15.1. Vehicle OFF, disconnect the harness connector at the device.

15.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

15.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the device.

⇓ **If the device activates**

16. Test or replace the KR104A Battery Saver Relay 1.

Component Testing

Relay Test

1. Vehicle OFF, disconnect the KR104A Battery Saver Relay 1.
2. Test for 70–150 Ω between terminals the following terminals.
   - 1 and 6
   - 2 and 6

⇒ **If less than 70 or greater than 150 Ω**

Replace the relay.

⇓ **If between 70–150 Ω**

3. Install a 3 A fused jumper wire between relay terminal 1 and 12 V. Install a jumper wire between relay terminal 6 and ground.

4. Test for infinite resistance between the following terminals:
   - 3 and 6
   - 3 and 5
   - 3 and 1
   - 3 and 2
   - 1 and 5
   - 2 and 5

⇒ **If less than infinite resistance**

Replace the relay.

⇓ **If infinite resistance**

5. Install a 3 A fused jumper wire between relay terminal 1 and 12 V. Install a jumper wire between relay terminal 6 and ground.
6. Test for less than 5.0 Ω between terminals 3 and 5.

⇒ **If 5.0 Ω or greater**

Replace the relay.

⇓ **If less than 5.0 Ω**

7. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Control Module References on page 6-3* for body control module replacement, programming and setup.

DTC C0847, C0848, C1240, or C1241

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC C0847 00: Device Ignition 1 Circuit Low
DTC C0848 00: Device Ignition 1 Circuit High
DTC C1240 00: Electronic Brake Control Module Ignition On/Start Switch Circuit Low Voltage
DTC C1241 00: Electronic Brake Control Module Ignition On/Start Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	C0847 00, C1240 00	C0847 00, C1240 00	C0848 00, C1241 00	—

Circuit/System Description

The body control module (BCM) controls the ignition relay through the control circuit by applying voltage to the circuit. The ignition circuit is energized when the vehicle power mode is Vehicle ON or Vehicle in Service Mode. The hybrid powertrain control module 2 sends the Vehicle ON or Vehicle in Service Mode power mode status in a serial data message to the electronic brake control module.

Conditions for Running the DTC

C0847 00, C1240 00

- Hybrid powertrain control module 2 is awake.
- System voltage between 9 and 16 V.
- Vehicle power mode is Vehicle ON or Vehicle in Service Mode.
- The DTC can only run when the output is activated.

C0848 00, C1241 00

- Hybrid powertrain control module 2 is awake.
- System voltage between 9 and 16 V.
- Vehicle power mode is Vehicle OFF.

Conditions for Setting the DTC

C0847 00, C1240 00

- Hybrid powertrain control module 2 is awake.
- Ignition output is active and a short to ground or open circuit is detected for greater than 5 seconds.

C0848 00, C1241 00

- Hybrid powertrain control module 2 is awake.
- Ignition output is not active and a short to battery is detected for greater than 5 seconds.

Action Taken When the DTC Sets

No action is taken.

Conditions for Clearing the DTC

- The current DTC will clear when the malfunction is no longer present during a DTC check.
- A history DTC clears when the module power mode cycle counter reaches the reset threshold of 40, without a repeat of the malfunction.

Diagnostic Aids

A short to voltage in the ignition circuit will keep the vehicle modules awake, which can drain the vehicle's battery.

Reference Information

Schematic Reference

- *Power Distribution Schematics on page 11-314*
- *Antilock Brake System Schematics on page 5-6*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify DTC B144B is not set.

⇒ **If the DTC is set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If the DTC is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

1. Vehicle OFF, disconnect the harness connector at the K17 Electronic Brake Control Module.
2. Verify that a test lamp does not illuminate between the ignition circuit terminal 14 and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

⇓ **If the test lamp does not illuminate**

3. Vehicle in Service Mode
4. Verify a test lamp illuminates between the ignition circuit terminal 14 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF, remove the test lamp.

4.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, refer to *Power Mode Mismatch on page 11-857*

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF, remove the test lamp.

4.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K17 Electronic Brake Control Module.

⇓ **If the test lamp illuminates**

5. Replace the K17 Electronic Brake Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

See *Control Module References on page 6-3* for electronic brake control module replacement, programming and setup.

DTC C0857 or C1242

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC C0857 00: Device Ignition Accessory Circuit Low

DTC C1242 00: Electronic Brake Control Module Ignition Accessory Switch Circuit Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Serial data wake-up	C0857 00, C1242 00, P06E4, U1814, U2099	C0857 00, C1242 00	—	—

Circuit/System Description

The hybrid powertrain control module 2 sends the serial data wake-up power mode status in a serial data message to the electronic brake control module (EBCM). The hybrid powertrain control module 2 also powers up the serial data wake-up circuit to the EBCM when the vehicle power mode is Vehicle ON or Vehicle in Service Mode.

Conditions for Running the DTC

- Hybrid powertrain control module 2 is awake
- Vehicle power mode is Vehicle ON or Vehicle in Service Mode
- Battery energy control module is awake
- System voltage greater than 9 V

Conditions for Setting the DTC

- Hybrid powertrain control module 2 is awake
- Ignition input is active, and 500 ms after the ignition input transitions high, a voltage below 5 V is detected 3 consecutive times

Action Taken When the DTC Sets

No action is taken.

Conditions for Clearing the DTC

- The current DTC will clear when the malfunction is no longer present.
- A history DTC clears when the module power mode cycle counter reaches the reset threshold of 40, without a repeat of the malfunction.

Diagnostic Aids

A short to voltage in the serial data wake-up circuit will keep the vehicle modules awake, which can drain the vehicle's battery.

Reference Information

Schematic Reference

- *Data Communication Schematics on page 11-6*
- *Antilock Brake System Schematics on page 5-6*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify DTC U1814, U2099, or P06E4 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

2. Vehicle in Service Mode, verify that DTC P1A60, C0857, C1242, or P2537 are not set.

⇒ **If three or more DTCs are set**

Refer to Circuit/System Testing – Hybrid Powertrain Control Module 2 Circuit Malfunction.

⇒ **If DTC C0857 or C1242 is set in the K17 Electronic Brake Control Module**

Refer to Circuit/System Testing – Electronic Brake Control Module Circuit Malfunction.

⇓ **If No DTC's are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Hybrid Powertrain Control Module 2 Circuit Malfunction

1. Vehicle OFF, disconnect the X2 harness connector at the K114B Hybrid/EV Powertrain Control Module 2.
2. Ignition ON.
3. Verify a test lamp illuminates between the Accessory Wake up Serial Data 2 circuit terminal 67 and ground.

⇒ **If the test lamp does not illuminate.**

3.1. Ignition OFF remove the test lamp, disconnect the X4 connector at the K9 Body Control Module.

3.2. Test for less than 2 Ω on the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

4. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Electronic Brake Control Module Circuit Malfunction

1. Vehicle OFF, disconnect the harness connector at the K17 Electronic Brake Control Module.
2. Connect a test lamp between the serial data wake-up circuit terminal 12 and ground.
3. Verify the test lamp turns ON and OFF when switching the ignition between Vehicle in Service Mode and Vehicle OFF.

⇒ **If the test lamp is always OFF**

3.1. Test for less than 2 Ω in the serial data wake-up circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇒ **If the test lamp is always ON**

3.1. Vehicle OFF, remove the test lamp.

3.2. Test for less than 1 V between the ignition circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp turns ON and OFF**

4. Test or replace the K17 Electronic Brake Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for the electronic brake control module or hybrid powertrain control module 2 replacement, programming and setup.

DTC P15B9 or P15BA

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P15B9: Electric A/C Compressor Control Module Ignition On/Start Switch Circuit Low Voltage
DTC P15BA: Electric A/C Compressor Control Module Ignition On/Start Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Electric A/C compressor control module ignition	P15B9	P15B9	P15BA	—

Circuit/System Description

The body control module (BCM) controls the ignition relay through the control circuit by applying voltage to the circuit. The ignition circuit is energized when the vehicle power mode is Vehicle ON or Vehicle in Service Mode.

Conditions for Running the DTC

P15B9

- Hybrid powertrain control module 2 is awake.
- Vehicle power mode is Vehicle ON or Vehicle in Service Mode.
- System voltage greater than 10.25 V.

P15BA

- Hybrid powertrain control module 2 is awake.
- Vehicle power mode is Vehicle OFF.
- System voltage greater than 10.25 V.

Conditions for Setting the DTC

P15B9

- Hybrid powertrain control module 2 is awake.
- Vehicle power mode is Vehicle ON or Vehicle in Service Mode.
- Hybrid powertrain control module 2 ignition input is active.
- A/C compressor ignition input is not active and not greater than 5 V.

P15BA

- Hybrid powertrain control module 2 is awake.
- Vehicle power mode is Vehicle OFF.
- Hybrid powertrain control module 2 ignition input is not active.
- A/C compressor ignition input is active and not below 5 V.

Action Taken When the DTC Sets

P15B9, P15BA

DTCs P15B9 and P15BA are type A DTCs.

Conditions for Clearing the DTC

P15B9 or P15BA

DTCs P15B9 and P15BA, are type A DTCs.

Diagnostic Aids

A short to voltage in the ignition circuit will keep the vehicle modules awake, which can drain the vehicle's battery.

Reference Information

Schematic Reference

Power Distribution Schematics on page 11-314

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-92

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify DTC B144B is not set.

⇒ **If the DTC is set**

Refer to *DTC B144B on page 11-831*.

⇓ **If the DTC is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

Danger: High voltage enabling and disabling shall be only performed by High Voltage Qualified Technicians. The procedures for high voltage enabling/disabling can be found in the service instructions and must be strictly followed at all times. The usage of the Protocol High Voltage Disabling / Enabling is mandatory. The High Voltage Qualified Technician is responsible for the adherence to the manufacturer's service instructions as well as current national legal regulations.

Failure to follow the procedures exactly as written may result in serious injury or death.

Questions regarding training can be answered by your national training centre.

Danger: Any hybrid/EV battery pack replacement shall be performed by High Voltage Qualified Technicians only. The replacement procedure can be found in the service instruction and must be strictly followed at all times. The High Voltage Qualified Technician is responsible for adherence to the manufacturer's service instructions as well as current national legal regulations. If the hybrid/EV battery pack needs to be replaced contact the Technical Assistance Centre for further instructions prior removal of the battery pack.

1. Perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to *High Voltage Disabling on page 9-363*.
2. Reconnect the 12 V battery.
3. Vehicle OFF, disconnect the X1 harness connector at the G1 A/C Compressor.
4. Verify that a test lamp does not illuminate between the ignition circuit terminal 3 and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

⇓ **If the test lamp does not illuminate**

5. Vehicle in Service Mode
6. Verify a test lamp illuminates between the ignition circuit terminal 3 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, refer to *Power Mode Mismatch on page 11-857*.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the G1 A/C Compressor.

6.2. Test for infinite resistance between the ignition circuit terminal 3 and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the G1 A/C Compressor.

⇓ **If the test lamp illuminates**

7. Replace the G1 A/C Compressor.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Seat Belt Indicator Malfunction - Passenger on page 12-89*
- *Inside Rearview Mirror Replacement on page 4-215*
- *Control Module References on page 6-3* for the appropriate control module replacement, programming and setup.

DTC P1A5E or P1A5F

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1A5E: Battery Energy Control Module Ignition On/Start Switch Circuit Low Voltage
DTC P1A5F: Battery Energy Control Module Ignition On/Start Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Battery energy control module ignition	P1A5E	P1A5E	P1A5F	—

Circuit/System Description

The body control module (BCM) controls the ignition main relay 1 through the control circuit by applying voltage to the circuit. The ignition circuit is energized when the vehicle power mode is Vehicle ON or Vehicle in Service Mode.

Conditions for Running the DTC

P1A5E

- Vehicle power mode is Vehicle ON or Vehicle in Service Mode.
- Battery energy control module is awake.
- System voltage greater than 9 V.

P1A5F

- Vehicle power mode is Vehicle OFF.
- Battery energy control module is awake.
- System voltage greater than 9 V.

Conditions for Setting the DTC

P1A5E

- Ignition input is active and not above 5 V.

P1A5F

- Ignition input is not active and not below 5 V.

Action Taken When the DTC Sets

P1A5E, P1A5F

DTCs P1A5E and P1A5F are type B DTCs.

Conditions for Clearing the DTC

P1A5E, P1A5F

DTCs P1A5E and P1A5F are type B DTCs.

Diagnostic Aids

A short to voltage in the ignition circuit will keep the vehicle modules awake, which can drain the vehicle's battery.

Reference Information

Schematic Reference

Power Distribution Schematics on page 11-314

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify DTC B144B is not set.

⇒ **If the DTC is set**

Refer to *DTC B144B on page 11-831*.

⇓ **If the DTC is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

Danger: High voltage enabling and disabling shall be only performed by High Voltage Qualified Technicians. The procedures for high voltage enabling/disabling can be found in the service instructions and must be strictly followed at all times. The usage of the Protocol High Voltage Disabling / Enabling is mandatory. The High Voltage Qualified Technician is responsible for the

adherence to the manufacturer's service instructions as well as current national legal regulations.

Failure to follow the procedures exactly as written may result in serious injury or death.

Questions regarding training can be answered by your national training centre.

Danger: Any hybrid/EV battery pack replacement shall be performed by High Voltage Qualified Technicians only. The replacement procedure can be found in the service instruction and must be strictly followed at all times. The High Voltage Qualified Technician is responsible for adherence to the manufacturer's service instructions as well as current national legal regulations. If the hybrid/EV battery pack needs to be replaced contact the Technical Assistance Centre for further instructions prior removal of the battery pack.

1. Perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to *High Voltage Disabling on page 9-363*.
2. Reconnect the 12 V battery.
3. Vehicle OFF, disconnect the X12 harness connector at the K16 Battery Energy Control Module.
4. Verify that a test lamp does not illuminate between the ignition circuit terminal 12 and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

⇓ **If the test lamp does not illuminate**

5. Vehicle in Service Mode
6. Verify a test lamp illuminates between the ignition circuit terminal 12 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, refer to *Power Mode Mismatch on page 11-857*

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF, remove the test lamp

6.2. Test for infinite resistance between the ignition circuit terminal 12 and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K16 Battery Energy Control Module.

⇓ **If the test lamp illuminates**

7. Replace the K16 Battery Energy Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for control module replacement, programming and setup.

DTC P1A60

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1A60: Battery Energy Control Module Ignition Accessory Switch Circuit Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Serial Data Wake-Up	P1A60, P06E4, U1814, U2099	P1A60	—	—

Circuit/System Description

The hybrid powertrain control module 2 sends the serial data wake-up power mode status in a serial data message to the battery energy control module. The hybrid powertrain control module 2 also powers up the serial data wake-up circuit to the battery energy control module when the vehicle power mode is Vehicle ON or Vehicle in Service Mode.

Conditions for Running the DTC

- Vehicle power mode is Vehicle ON or Vehicle in Service Mode
- Battery energy control module is awake
- System voltage greater than 9 V

Conditions for Setting the DTC

Ignition input is active, and 500 ms after the ignition input transitions high, a voltage below 5 V is detected 3 consecutive times

Action Taken When the DTC Sets

DTC P1A60 is a type B DTC.

Conditions for Clearing the DTC

DTC P1A60 is a type B DTC.

Diagnostic Aids

A short to voltage in the serial data wake-up circuit will keep the vehicle bus awake, which can drain the vehicle's battery.

Reference Information

Schematic Reference

Data Communication Schematics on page 11-6

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-92

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify DTC U1814, U2099, or P06E4 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

2. Vehicle in Service Mode, verify that DTC P1A60, C0857, C1242, or P2537 are not set.

⇒ **If two or more DTCs are set**

Refer to Circuit/System Testing – Hybrid Powertrain Control Module 2 Circuit Malfunction.

⇒ **If DTC P1A60 is set in the K16 Battery Energy Control Module**

Refer to Circuit/System Testing – Battery Energy Control Module Circuit Malfunction.

⇓ **If No DTC's are set**

3. Refer to Circuit/System Testing.

Circuit/System Testing

Danger: High voltage enabling and disabling shall be only performed by High Voltage Qualified Technicians. The procedures for high voltage enabling/disabling can be found in the service instructions and must be strictly followed at all times. The usage of the Protocol High Voltage Disabling / Enabling is mandatory. The High Voltage Qualified Technician is responsible for the adherence to the manufacturer's service instructions as well as current national legal regulations.

Failure to follow the procedures exactly as written may result in serious injury or death.

Questions regarding training can be answered by your national training centre.

Danger: Any hybrid/EV battery pack replacement shall be performed by High Voltage Qualified Technicians only. The replacement procedure can be found in the service instruction and must be strictly followed at all times. The High Voltage Qualified Technician is responsible for adherence to the manufacturer's service instructions as well as current national legal regulations. If the hybrid/ EV battery pack needs to be replaced contact the Technical Assistance Centre for further instructions prior removal of the battery pack.

Hybrid Powertrain Control Module 2 Circuit Malfunction

1. Vehicle OFF, disconnect the X2 harness connector at the K114B Hybrid/EV Powertrain Control Module 2.
2. Ignition ON.
3. Verify a test lamp illuminates between the Accessory Wake up Serial Data 2 circuit terminal 67 and ground.

⇒ **If the test lamp does not illuminate.**

3.1. Ignition OFF remove the test lamp, disconnect the X4 connector at the K9 Body Control Module.

3.2. Test for less than 2 Ω on the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

4. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Battery Energy Control Module

1. Perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to *High Voltage Disabling on page 9-363*.
2. Reconnect the 12 V battery.
3. Vehicle OFF, disconnect the X12 harness connector at the K16 Battery Energy Control Module.
4. Connect a test lamp between the serial data wake-up circuit terminal 13 and ground.
5. Verify the test lamp turns ON and OFF when cycling the S39 Ignition Mode Switch between Vehicle in Service Mode and Vehicle OFF.

⇒ **If the test lamp is always OFF**

5.1. Vehicle OFF.

5.2. Test for less than 2 Ω in the serial data wake-up circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇒ **If the test lamp is always ON**

5.1. Vehicle OFF, remove the test lamp

5.2. Test for less than 1 V between the ignition circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp turns ON and OFF**

6. Test or replace the K16 Battery Energy Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for control module replacement, programming and setup,

DTC P1EF6 or P1EF7

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1EF6: Battery Charger Control Module Ignition On/Start Switch Circuit Low Voltage
DTC P1EF7: Battery Charger Control Module Ignition On/Start Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Battery Charger Control Module Ignition	P1EF6	P1EF6	P1EF7	—

Circuit/System Description

The body control module (BCM) controls the ignition relay through the control circuit by applying voltage to the circuit. The ignition circuit is energized when the vehicle power mode is Vehicle ON or Vehicle in Service Mode.

Conditions for Running the DTC

P1EF6

- System voltage between 9–16 V.
- Vehicle power mode is Vehicle ON or Vehicle in Service Mode.
- This DTC can only run when the output is activated.

P1EF7

- System voltage between 9–16 V.
- Vehicle power mode is Vehicle OFF.

Conditions for Setting the DTC

P1EF6

- Ignition output is active and a short to ground is detected 3 consecutive times.
- Ignition output is not active and an open circuit is detected 20 consecutive times.

P1EF7

- Ignition output is not active and a short to battery is detected 3 consecutive times.

Action Taken When the DTC Sets

P1EF6

- The ignition output is deactivated when a short to ground is detected. After 100 ms the output is activated again. This happens 3 times and then the output is deactivated until a new Vehicle ON or Vehicle in Service Mode request is received.
- Open: No action is taken.

P1EF7

No action is taken

Conditions for Clearing the DTC

P1EF6, P1EF7

- The current DTC will clear when the malfunction is no longer present during a DTC check.
- A history DTC clears when the module power mode cycle counter reaches the reset threshold of 40, without a repeat of the malfunction.

Diagnostic Aids

A short to voltage in the ignition circuit will keep the vehicle modules awake, which can drain the vehicle's battery.

Reference Information

Schematic Reference

Power Distribution Schematics on page 11-314

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-92

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify DTC B144B is not set.

⇒ **If the DTC is set**

Refer to *DTC B144B on page 11-831*.

⇓ **If the DTC is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

Danger: High voltage enabling and disabling shall be only performed by High Voltage Qualified Technicians. The procedures for high voltage enabling/disabling can be found in the service instructions and must be strictly followed at all times. The usage of the Protocol High Voltage Disabling / Enabling is mandatory. The High Voltage Qualified Technician is responsible for the adherence to the manufacturer's service instructions as well as current national legal regulations.

Failure to follow the procedures exactly as written may result in serious injury or death.

Questions regarding training can be answered by your national training centre.

Danger: Any hybrid/EV battery pack replacement shall be performed by High Voltage Qualified Technicians only. The replacement procedure can be found in the service instruction and must be strictly followed at all times. The High Voltage Qualified Technician is responsible for adherence to the manufacturer's service instructions as well as current national legal regulations. If the hybrid/EV battery pack needs to be replaced contact the Technical Assistance Centre for further instructions prior removal of the battery pack.

1. Perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to *High Voltage Disabling on page 9-363*.
2. Reconnect the 12 V battery.
3. Vehicle OFF, disconnect the X1 harness connector at the T18 Battery Charger.
4. Verify that a test lamp does not illuminate between the ignition circuit terminal A and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

⇓ **If the test lamp does not illuminate**

5. Vehicle in Service Mode
6. Verify a test lamp illuminates between the ignition circuit terminal A and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

6.1. Vehicle OFF.

6.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, refer to *Power Mode Mismatch on page 11-857*.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

6.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the T18 Battery Charger.

6.2. Test for infinite resistance between the ignition circuit terminal A and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance, replace the K57 Battery Charger Control Module.

⇓ **If the test lamp illuminates**

7. Replace the K57 Battery Charger Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for the battery charger control module replacement, programming and setup.

DTC P2534 or P2535

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P2534: Ignition On/Start Switch Circuit Low Voltage
DTC P2535 : Ignition On/Start Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2534	P2534	P2535	—

Circuit/System Description

The body control module (BCM) controls the ignition relay through the control circuit by applying voltage to the circuit. The ignition circuit is energized when the vehicle power mode is Vehicle ON or Vehicle in Service Mode.

Conditions for Running the DTC

P2534, P2535

The control module is awake.

Conditions for Setting the DTC

P2534

The control module detects 2 V or less on the ignition voltage circuit.

P2535

The control module detects greater than 5 V or greater on the ignition voltage circuit, with the ignition turned OFF.

Action Taken When the DTC Sets

P2534, P2535

DTCs P2534 and P2535 are type A DTCs.

Conditions for Clearing the DTC

P2534, P2535

DTCs P2534 and P2535 are type A DTCs.

Diagnostic Aids

A short to voltage in the ignition circuit will keep the vehicle modules awake, which can drain the vehicle's battery.

Reference Information

Schematic Reference

Power Distribution Schematics on page 11-314

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-92

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify DTC B144B is not set.

⇒ **If the DTC is set**

Refer to *DTC B144B on page 11-831*.

⇓ **If the DTC is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

Danger: High voltage enabling and disabling shall be only performed by High Voltage Qualified Technicians. The procedures for high voltage enabling/disabling can be found in the service instructions and must be strictly followed at all times. The usage of the Protocol High Voltage Disabling / Enabling is mandatory. The High Voltage Qualified Technician is responsible for the

adherence to the manufacturer's service instructions as well as current national legal regulations.

Failure to follow the procedures exactly as written may result in serious injury or death.

Questions regarding training can be answered by your national training centre.

Danger: Any hybrid/EV battery pack replacement shall be performed by High Voltage Qualified Technicians only. The replacement procedure can be found in the service instruction and must be strictly followed at all times. The High Voltage Qualified Technician is responsible for adherence to the manufacturer's service instructions as well as current national legal regulations. If the hybrid/EV battery pack needs to be replaced contact the Technical Assistance Centre for further instructions prior removal of the battery pack.

1. Vehicle OFF and all vehicle systems off, disconnect the harness connector at the control module setting the DTC.
2. Verify that a test lamp does not illuminate between the ignition circuit and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

⇓ **If the test lamp does not illuminate**

3. Vehicle in Service Mode.
4. Verify a test lamp illuminates between the ignition circuit and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF, remove the test lamp.

4.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, refer to *Power Mode Mismatch on page 11-857*

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF, remove the test lamp.

4.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the control module setting the DTC.

⇓ **If the test lamp illuminates**

5. Replace the control module setting the DTC.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for the appropriate control module replacement, programming and setup.

DTC P2537 (Hybrid/EV Powertrain Control Module 2)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P2537: Ignition Accessory Switch Circuit Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2537, P06E4, U1814, U2099	P2537	—	—

Circuit/System Description

The control module continuously monitors the voltage on the ignition accessory circuit every 0.1s. Higher or lower than normal voltage may cause erratic vehicle operation.

Conditions for Running the DTC

P2537

Propulsion system is active for .5 s.

Conditions for Setting the DTC

P2537

The hybrid powertrain control module 2 detects the accessory voltage circuit is open for 0.1 s.

Action Taken When the DTC Sets

P2537

P2537 is a Type B DTC.

Conditions for Clearing the DTC

P2537

P2537 is a Type B DTC.

Diagnostic Aids

A short to voltage in the ignition circuit will keep the vehicle modules awake, which can drain the vehicle's battery.

Reference Information

Schematic Reference

Data Communication Schematics on page 11-6

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-92

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify DTC U1814, U2099, or P06E4 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

2. Vehicle in Service Mode, verify that DTC P1A60, C0857, C1242, or P2537 is not set.

⇒ **If two or more DTCs are set**

Refer to Circuit/System Testing – Hybrid Powertrain Control Module 2 Circuit Malfunction.

⇒ **If DTC P2537 is set in the K20 Engine Control Module**

Refer to Circuit/System Testing – Engine Control Module Circuit Malfunction.

⇒ **If DTC P2537 is set in the K114A Hybrid/EV Powertrain Control Module 1**

Refer to Circuit/System Testing – Hybrid/EV Powertrain Control Module 1 Circuit Malfunction.

⇓ **If No DTC's are set**

3. All OK

Circuit/System Testing

Danger: High voltage enabling and disabling shall be only performed by High Voltage Qualified Technicians. The procedures for high voltage enabling/disabling can be found in the service instructions and must be strictly followed at all times. The usage of the Protocol High Voltage Disabling / Enabling is mandatory. The High Voltage Qualified Technician is responsible for the adherence to the manufacturer's service instructions as well as current national legal regulations.

Failure to follow the procedures exactly as written may result in serious injury or death.

Questions regarding training can be answered by your national training centre.

Danger: Any hybrid/EV battery pack replacement shall be performed by High Voltage Qualified Technicians only. The replacement procedure can be found in the service instruction and must be strictly followed at all times. The High Voltage Qualified Technician is responsible for adherence to the manufacturer's service instructions as well as current national legal regulations. If the hybrid/EV battery pack needs to be replaced contact the Technical Assistance Centre for further instructions prior removal of the battery pack.

Hybrid Powertrain Control Module 2 Circuit Malfunction

1. Vehicle OFF and all vehicle systems off, disconnect the X2 harness connector at the K114B Hybrid/EV Powertrain Control Module 2.
2. Vehicle in Service Mode.
3. Verify a test lamp illuminates between the ignition circuit terminal 67 and ground.

⇒ **If the test lamp does not illuminate**

3.1. Vehicle OFF, remove the test lamp, disconnect the connector at the K9 Body Control Module.

3.2. Test for less than 2 Ω on the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

4. Replace the K114B Hybrid/EV Powertrain Control Module 2.

Engine Control Module Circuit Malfunction

1. Vehicle OFF and all vehicle systems off, disconnect the X1 harness connector at the K20 Engine Control Module.
2. Vehicle in Service Mode.
3. Verify a test lamp illuminates between the Accessory Wake up Serial Data 2 circuit terminal 18 and ground.

⇒ **If the test lamp does not illuminate**

3.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the KR114B Hybrid/EV Powertrain Control Module 2.

3.2. Test for less than 2 Ω on the Accessory Wake up Serial Data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the KR114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

4. Replace the control module setting the K20 Engine Control Module.

Hybrid Powertrain Control Module 1 Circuit Malfunction

1. Perform the High Voltage Disabling procedure before proceeding with this diagnostic. Refer to *High Voltage Disabling on page 9-363*.
2. Reconnect the 12 V battery.
3. Vehicle OFF and all vehicle systems off, disconnect the X2 harness connector at the T6 power inverter module 1.
4. Vehicle in Service Mode.
5. Verify a test lamp illuminates between the Accessory Wake up Serial Data 2 circuit terminal 11 and ground.

⇒ **If the test lamp does not illuminate**

5.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the KR114B Hybrid/EV Powertrain Control Module 2.

5.2. Test for less than 2 Ω on the Accessory Wake up Serial Data 2 circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the KR114B Hybrid/EV Powertrain Control Module 2.

⇓ **If the test lamp illuminates**

6. Replace the T6 power inverter module 1.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for control module replacement, programming and setup,

Ignition Can/Cannot Be Turned Off with Transmission in Any Gear

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	2	1	—	—
Ground	—	1	—	—
1. Ignition will not turn to OFF with vehicle in park 2. Ignition will turn to OFF with vehicle out of park				

Circuit/System Description

The electronic park lock system purpose is to prevent the ignition from being switched to the OFF position when the transmission shift lever is in any position other than Park and the vehicle may still be moving. The electronic park lock system incorporates the park position switch that located in the shift lock control switch. When the transmission shift lever is in Park, the park position switch closes and the BCM allows the ignition to be turned OFF.

If the vehicle is not in Park, the ignition will turn to ACC/ ACCESSORY and display the message SHIFT TO PARK in the Driver Information Center. When the vehicle is shifted into Park, the ignition system will switch to OFF.

Diagnostic Aids

Verify that the transmission shift selector indicator matches the position of the transmission shift lever while selecting between the Park, Reverse, Drive and Low positions.

Reference Information

Schematic Reference

Shift Lock Control Schematics on page 16-99

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Electronic Park Lock Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify the scan tool Body Control Module In Park Switch Status parameter changes between On and Off when shifting the S3 Transmission Shift Lever in and out of Park.

⇒ **If the parameter does not change**

Refer to Circuit/System Testing.

⇓ **If the parameter changes**

3. All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S3 Transmission Shift Lever. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 6 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.

4. Verify the scan tool Body Control Module In Park Switch Status parameter is Off.

⇒ **If not Off**

4.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.

4.2. Test for infinite resistance between the signal circuit terminal 5 and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K9 Body Control Module.

⇓ **If Off**

5. Install a 3 A fused jumper wire between the signal circuit terminal 5 and the ground circuit terminal 6.
6. Verify the scan tool Body Control Module In Park Switch Status parameter is On.

⇒ **If not On**

6.1. Vehicle OFF, remove the jumper wire, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

6.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇓ If less than 1 V

6.3. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If On**

7. Test or replace the S3 Transmission Shift Lever.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Transmission Control Replacement on page 16-34*
- *Control Module References on page 6-3* for body control module replacement, programming, and setup.

Power Mode Mismatch

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Circuit/System Description

The body control module (BCM) controls the ignition main relay 1, ignition main relay 2, ignition run, and retained accessory power relays by applying voltage to their individual relay control circuits. The ignition main relay 1, ignition main relay 2, and ignition run relay are energized when the vehicle is in Service Mode or the vehicle is ON. The BCM controls the ignition main relay 1 through the control circuit by applying voltage to the run/crank relay control circuit. The ignition main relay 2 is controlled from the ignition main relay 1 ignition circuit. The BCM controls the ignition run relay through the control circuit by applying voltage to the auxiliary ignition run relay control circuit. The retained accessory power relay is energized during all power modes, except OFF-awake. The relay is also energized for approximately 10 min after shutting the vehicle OFF providing no door is opened. The BCM controls the retained accessory power relay through the control circuit by applying voltage to the accessory/retained accessory power relay control circuit.

The BCM also controls the battery saver relay through individual circuits by applying voltage to the battery saver set and reset circuits. The battery saver relay is a latching relay that when enabled disconnects some modules from their ignition power or memory power sources.

Diagnostic Aids

A short to voltage on the ignition run/crank relay coil control circuit will cause the vehicle to remain ON after the mode is changed to OFF. The service vehicle soon indicator and passenger air bag indicator will remain illuminated with vehicle OFF.

Reference Information

Schematic Reference

- *Power Distribution Schematics on page 11-314*
- *Power Moding Schematics on page 11-327*

Connector End View Reference

Component Connector End Views on page 11-455

Electrical Center Identification View Reference

Electrical Center Identification Views on page 11-430

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Relay Replacement (Within an Electrical Center) on page 11-953* or *Relay Replacement (Attached to Wire Harness) on page 11-953*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note: The vehicle may not be equipped with all components as listed below. Use schematics to determine which ignition relay supplies the ignition feed

for the appropriate devices. Use the connector end view to identify the ignition circuit terminal for each of those devices.

1. Vehicle in Service Mode.
2. Verify that the appropriate devices controlled by the KR73A Ignition Main Relay 1 turn ON and OFF when commanding the Run/Crank Relay On and Off with a scan tool.

⇒ **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing – Diagnostic A.

⇓ **If the devices turn ON and OFF**

3. Verify that the appropriate devices controlled by the KR73B Ignition Main Relay 2 turn ON and OFF when commanding the Run/Crank Relay On and Off with a scan tool.

⇒ **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing – Diagnostic B.

⇓ **If the devices turn ON and OFF**

4. Verify that the appropriate devices controlled by the KR76 Retained Accessory Power Relay turn ON and OFF when commanding the Accessory/ Retained Accessory Power Relay On and Off with a scan tool.

⇒ **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing – Diagnostic C.

⇓ **If the devices turn ON and OFF**

5. Verify that the appropriate devices controlled by the KR74 Ignition Run Relay turn ON and OFF when changing from Vehicle ON to Vehicle OFF.

⇒ **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing – Diagnostic D.

⇓ **If the devices turn ON and OFF**

6. Verify that the appropriate devices controlled by the KR104A Battery Saver Relay 1 turn ON and OFF after enabling battery saver mode (transport mode).

⇒ **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing – Diagnostic E.

⇓ **If the devices turn ON and OFF**

7. All OK.

Circuit/System Testing

Diagnostic A

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR73A Ignition Main Relay 1. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. Verify a test lamp illuminates between the B+ circuit terminal 87 and ground.

⇒ **If the test lamp does not illuminate**

Replace the X50A Fuse Block - Underhood.

⇓ **If the test lamp illuminates**

5. Connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 85.
6. Verify the test lamp turns ON and OFF when commanding the Run/Crank Relay On and Off with a scan tool.

⇒ **If the test lamp is always OFF**

6.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

6.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

6.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

6.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

7. Verify that a test lamp does not illuminate between the ignition circuit terminal 30 and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit

⇓ **If the test lamp does not illuminate**

8. Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 87 and the ignition circuit terminal 30.

9. Verify device is activated.

⇒ **If the device does not activate**

9.1. Vehicle OFF, disconnect the harness connector at the device.

9.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

9.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the device.

⇓ **If the device activates**

10. Test or replace the KR73A Ignition Main Relay 1.

Diagnostic B

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR73B Ignition Main Relay 2. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. Verify a test lamp illuminates between the B+ circuit terminal 87 and ground.

⇒ **If the test lamp does not illuminate**

Replace the X50A Fuse Block - Underhood.

⇓ **If the test lamp illuminates**

5. Connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 85.
6. Verify the test lamp turns ON and OFF when commanding the Run/Crank Relay On and Off with a scan tool.

⇒ **If the test lamp is always OFF**

6.1. Vehicle OFF, remove the test lamp, disconnect the KR73A Ignition Main Relay 1.

6.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, refer to Circuit/System Testing – Diagnostic A.

⇒ **If the test lamp is always ON**

6.1. Vehicle OFF, remove the test lamp, disconnect the KR73A Ignition Main Relay 1, Vehicle in Service Mode.

6.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, refer to Circuit/System Testing – Diagnostic A.

⇓ **If the test lamp turns ON and OFF**

7. Verify that a test lamp does not illuminate between the ignition circuit terminal 30 and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit

⇓ **If the test lamp does not illuminate**

8. Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 87 and the ignition circuit terminal 30.
9. Verify device is activated.

⇒ **If the device does not activate**

9.1. Vehicle OFF, disconnect the harness connector at the device.

9.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

9.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the device.

⇓ **If the device activates**

10. Test or replace the KR73B Ignition Main Relay 2.

Diagnostic C

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR76 Retained Accessory Power Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 86 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.

4. Verify a test lamp illuminates between the B+ circuit terminal 30 and ground.

⇒ **If the test lamp does not illuminate**

Replace the X51A Fuse Block - Instrument Panel.

⇓ **If the test lamp illuminates**

5. Connect a test lamp between the control circuit terminal 85 and the ground circuit terminal 86.
6. Verify the test lamp turns ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.

⇒ **If the test lamp is always OFF**

6.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

6.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

6.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

6.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

7. Verify that a test lamp does not illuminate between the ignition circuit terminal 87 and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit

⇓ **If the test lamp does not illuminate**

8. Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 30 and the ignition circuit terminal 87.
9. Verify device is activated.

⇒ **If the device does not activate**

9.1. Vehicle OFF, disconnect the harness connector at the device.

9.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

9.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the device.

⇓ **If the device activates**

10. Test or replace the KR76 Retained Accessory Power Relay.

Diagnostic D

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR74 Ignition Run Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. Verify a test lamp illuminates between the B+ circuit terminal 30 and ground.

⇒ **If the test lamp does not illuminate**

Replace the X51A Fuse Block - Instrument Panel.

⇓ **If the test lamp illuminates**

5. Connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 85.

6. Verify the test lamp turns ON and OFF when changing from Vehicle ON to Vehicle OFF.

⇒ **If the test lamp is always OFF**

6.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

6.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

6.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

6.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

7. Verify that a test lamp does not illuminate between the ignition circuit terminal 87 and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

⇓ **If the test lamp does not illuminate**

8. Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 30 and the ignition control circuit terminal 87.
9. Verify the device is activated.

⇒ **If the device does not activate**

9.1. Vehicle OFF, disconnect the harness connector at the device.

9.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

9.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the device.

⇓ **If the device activates**

10. Test or replace the KR74 Ignition Run Relay.

Diagnostic E

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR104A Battery Saver Relay 1. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 6 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. Verify a test lamp illuminates between the B+ circuit terminal 3 and ground.

⇒ **If the test lamp does not illuminate**

Replace the X51A Fuse Block - Instrument Panel.

⇓ **If the test lamp illuminates**

5. Enable battery saver mode (transport mode).
6. Vehicle OFF.
7. Connect a test lamp between the control circuit terminal 1 and the ground circuit terminal 6.
8. Verify the test lamp momentarily flashes ON and OFF when turning the ignition to Vehicle in Service Mode.

⇒ **If the test lamp is always OFF**

8.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

8.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

8.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

8.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

9. Connect a test lamp between the control circuit terminal 2 and ground circuit terminal 6.
10. Verify the test lamp momentarily flashes ON and OFF after turning the ignition to vehicle OFF.

    Note: It may take up to 1 min after the ignition is switched to vehicle OFF and retained accessory power is disabled before the body control module sends a command to unlatch the relay.

⇒ **If the test lamp is always OFF**

10.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

10.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

10.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

10.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

10.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

11. Verify that a test lamp does not illuminate between the ignition circuit terminal 5 and ground.

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

⇓ **If the test lamp does not illuminate**

12. Vehicle in Service Mode, connect a 40 A fused jumper wire between the B+ circuit terminal 3 and the ignition circuit terminal 5.
13. Verify device is activated.

⇒ **If the device does not activate**

13.1. Vehicle OFF, disconnect the harness connector at the device.

13.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

13.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the device.

⇓ **If the device activates**

14. Test or replace the KR104A Battery Saver Relay 1.

Component Testing

Relay Test

1. Vehicle OFF, disconnect the appropriate relay.
2. Test for 70–150 Ω between terminals 85 and 86.

⇒ **If less than 70 or greater than 150 Ω**

Replace the relay.

⇓ **If between 70–150 Ω**

3. Test for infinite resistance between the terminals listed below:
   - 30 and 86
   - 30 and 87
   - 30 and 85
   - 85 and 87

⇒ **If less than infinite resistance**

Replace the relay.

⇓ **If infinite resistance**

4. Test for less than 5.0 Ω between terminals 30 and 87.

⇒ **If 5.0 Ω or greater**

Replace the relay.

⇓ **If less than 5.0 Ω**

5. Install a 3 A fused jumper wire between relay terminal 85 and 12 V. Install a jumper wire between relay terminal 86 and ground.
6. Test for less than 5.0 Ω between terminals 30 and 87.

⇒ **If 5.0 Ω or greater**

Replace the relay.

⇓ **If less than 5.0 Ω**

7. All OK

Latching Relay Test

1. Vehicle OFF, disconnect the KR104A Battery Saver Relay 1.
2. Test for 70–150 Ω between terminals 1 and 6.

⇒ **If less than 70 or greater than 150 Ω**

Replace the relay.

⇓ **If between 70–150 Ω**

3. Test for 70–150 Ω between terminals 2 and 6.

⇒ **If less than 70 or greater than 150 Ω**

Replace the relay.

⇓ **If between 70–150 Ω**

4. Test for infinite resistance between the terminals listed below:
   - 3 and 1
   - 3 and 2
   - 3 and 6
   - 5 and 1

- 5 and 2
- 5 and 6

⇒ **If less than infinite resistance**

Replace the relay.

⇓ **If infinite resistance**

5. Install a 3 A fused jumper wire between relay terminal 1 and 12 V. Install a jumper wire between relay terminal 6 and ground.
6. Test for less than 5.0 Ω between terminals 3 and 5.

⇒ **If 5.0 Ω or greater**

Replace the relay.

⇓ **If less than 5.0 Ω**

7. Install a 3 A fused jumper wire between relay terminal 2 and 12 V. Install a jumper wire between relay terminal 6 and ground.
8. Test infinite resistance between terminals 3 and 5.

⇒ **If less than infinite resistance**

Replace the relay.

⇓ **If infinite resistance**

9. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Control Module References on page 6-3* for the appropriate control module replacement, programming and setup.

Retained Accessory Power Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Relay Switch B+	1	1	1	—
Relay Switch Ignition	1	1	1, 2	—
Relay Coil Control	B1445 02,	1	1	—
Relay Coil Ground	—	1	—	—
1. Retained accessory power malfunction 2. Retained accessory power relay always ON				

Circuit/System Description

The body control module (BCM) controls the retained accessory power relay through the control circuit by applying voltage to the retained accessory power relay coil control circuit. The retained accessory power relay is energized when the ignition switch is in the ACCESSORY or the ON position.

Reference Information

Schematic Reference

- *Power Moding Schematics on page 11-327*
- *Power Distribution Schematics on page 11-314*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Retained Accessory Power Description and Operation on page 11-962

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note: Use schematics to determine which devices are controlled by the KR76 Retained Accessory Power Relay. Use the connector end view to identify the ignition circuit terminal for each of those devices.

1. Ignition ON.
2. Verify the appropriate devices controlled by the KR76 Retained Accessory Power Relay turn ON and OFF when commanding the Accessory/ Retained Accessory Power Relay On and Off with a scan tool.

⇒ **If the devices do not turn ON and OFF**

Refer to Circuit/System Testing

⇓ **If the devices turn ON and OFF**

3. All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the KR76 Retained Accessory Power Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 86 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. Verify a test lamp illuminates between the B+ circuit terminal 30 and ground.

⇒ **If the test lamp does not illuminate**

Replace the X51A Fuse Block - Instrument Panel.

⇓ **If the test lamp illuminates**

5. Connect a test lamp between the control circuit terminal 85 and the ground circuit terminal 86.
6. Verify the test lamp turns ON and OFF when commanding the Accessory/Retained Accessory Power Relay On and Off with a scan tool.

⇒ **If the test lamp is always OFF**

6.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.

6.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

6.1. Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

6.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

7. Connect the KR76 Retained Accessory Power Relay.
8. Disconnect the appropriate X80 Accessory Power Receptacle or S79 Window Switch.
9. Vehicle OFF.
10. Verify that a test lamp does not illuminate between each of the ignition circuits listed below and ground.
    - X80G Accessory Power Receptacle- Instrument Panel - Ignition circuit terminal A
    - X80H Accessory Power Receptacle - Center Console - Ignition circuit terminal A
    - S79D Window Switch-Driver - Ignition circuit terminal 2
    - S79D Window Switch-Driver - Ignition circuit terminal 8
    - S79P Window Switch-Passenger - Ignition circuit terminal 6

⇒ **If the test lamp illuminates**

Repair the short to voltage on the ignition circuit.

⇓ **If the test lamp does not illuminate**

11. Vehicle in Service Mode.
12. Verify that a test lamp illuminates between each of the ignition circuits listed below and ground.
    - X80G Accessory Power Receptacle- Instrument Panel - Ignition circuit terminal A
    - X80H Accessory Power Receptacle - Center Console - Ignition circuit terminal A
    - S79D Window Switch-Driver - Ignition circuit terminal 2
    - S79D Window Switch-Driver - Ignition circuit terminal 8
    - S79P Window Switch-Passenger - Ignition circuit terminal 6

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

12.1. Vehicle OFF, remove the test lamp.

12.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, test or replace the KR76 Retained Accessory Power Relay.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

12.1. Vehicle OFF, remove the test lamp.

12.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, test or replace the appropriate X80 Accessory Power Receptacle or S79 Window Switch.

⇓ **If the test lamp illuminates**

13. Test or replace the appropriate X80 Accessory Power Receptacle or S79 Window Switch.

Component Testing

Relay Test

1. Vehicle OFF, disconnect the KR76 Retained Accessory Power Relay.
2. Test for 70–150 Ω between terminals 85 and 86.

⇒ **If less than 70 or greater than 150 Ω**

Replace the relay.

⇓ **If between 70–150 Ω**

3. Test for infinite resistance between the terminals listed below:
   - 30 and 86
   - 30 and 87
   - 30 and 85
   - 85 and 87

⇒ **If less than infinite resistance**

Replace the relay.

⇓ **If infinite resistance**

4. Test for less than 5.0 Ω between terminals 30 and 87.

⇒ **If 5.0 Ω or greater**

Replace the relay.

⇓ **If less than 5.0 Ω**

5. Install a 3 A fused jumper wire between relay terminal 85 and 12 V. Install a jumper wire between relay terminal 86 and ground.
6. Test for less than 5.0 Ω between terminals 30 and 87.

⇒ **If 5.0 Ω or greater**

Replace the relay.

⇓ **If less than 5.0 Ω**

7. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Relay Replacement (Within an Electrical Center) on page 11-953* or *Relay Replacement (Attached to Wire Harness) on page 11-953*
- *Accessory Power Receptacle Retainer Replacement on page 11-248*
- *Front Side Door Window Switch Replacement - Left Side on page 4-41*
- *Front Side Door Window Switch Replacement - Right Side on page 4-40*
- *Control Module References on page 6-3* for body control module replacement, programming and setup.

Vehicle ON/OFF Switch Indicator Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control	2	2	1	—
Ground	—	2	—	—
1. Vehicle ON/OFF switch indicator always on 2. Vehicle ON/OFF switch indicator inoperative				

Circuit/System Description

The vehicle ON/OFF switch has a single LED that indicates the vehicle power mode. When the vehicle is in the OFF mode, the LED is not illuminated. Pressing and holding the vehicle ON/OFF switch for up to 10 s, without the brake pedal applied, will enter the Vehicle Service Mode and the LED will illuminate. With the vehicle OFF and the brake pedal applied, pressing the vehicle ON/OFF switch once, the vehicle will enter the Vehicle ON mode and the LED will illuminate.

Reference Information

Schematic Reference

Power Moding Schematics on page 11-327

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify the LED illuminates when the S83 Vehicle ON/OFF Switch is pressed and held for at least 10 s, with the brake pedal released.

⇒ **If the LED does not illuminate**

Refer to Circuit/System Testing.

⇓ **If the LED illuminates**

2. All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S83 Vehicle ON/OFF Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 4 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Test for less than 1 V between the control circuit terminal 2 and ground.

⇒ **If 1 V of greater**

3.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

3.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇓ If less than 1 V

3.3. Test for less than 2 Ω in control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If less than 1 V**

4. Vehicle OFF, connect the harness connector at the S83 Vehicle ON/OFF Switch.
5. Vehicle in Service Mode, disconnect the harness connector at the S83 Vehicle ON/OFF Switch.
6. Test for B+ between the control circuit terminal 2 and ground.

Note: Do not use a test lamp to check for voltage. The K9 Body Control Module will shut down the output driver and not supply voltage on the control circuit until a new ignition request is received.

⇒ **If less than B+**

6.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.

6.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If B+**

7. Test or replace the S83 Vehicle ON/OFF Switch.

Component Testing

1. Vehicle OFF, disconnect the harness at the S83 Vehicle ON/OFF Switch.
2. Connect a jumper wire between the S83 Vehicle ON/OFF Switch terminal 4 and ground.
3. Connect a 3 A fused jumper wire between the S83 Vehicle ON/OFF Switch terminal 2and B+.
4. Verify the blue LED illuminates.

⇒ **If the LED does not illuminate**

Replace the S83 vehicle ON/OFF switch.

⇓ **If the LED illuminates**

5. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Ignition and Start Switch Replacement on page 11-957*
- *Control Module References on page 6-3* for body control module replacement, programming and setup.

Vehicle Will Not Change Power Mode

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+ terminal 5	B1370 04, B1380 04	B1370 04, B1380 04	—	—
Ignition Terminal 4	B1370 04, B1380 04	B1370 04, B1380 04	B1370 01	—
Ignition Terminal 6	B1370 04, B1380 04	B1380 04	B1380 01	—
Ignition Terminal 3	B1370 04, B1380 04, B1441 04	B1441 04	B1441 04	—
Signal Terminal 3	B097B 02*	B097B 05*	B097B 05*	—
Signal Terminal 6	B097B 02	B097B 04	B097B 04	—
5 V Reference terminal 2	—	2	—	—
Low Reference	—	B097B 05*	—	—
Ground	—	B097B 04	—	—
* DTC set in keyless entry control module 2. Power Mode Mismatch				

Circuit/System Description

Without BTM

The vehicle power mode master is the Body Control Module (BCM). The ignition switch is a low current switch with multiple discrete circuits to the BCM. The BCM logic uses the ignition switch positions to identify the operator's desired power mode and activate specific discrete signals, and serial data messages for the operation of different subsystems as necessary. Other modules which have switched voltage inputs may operate in a default mode if the power mode master serial data message does not match what the individual module can detect from its own connections.

The power mode master will activate relays and other direct outputs of the power mode master as needed according to the calculated power mode. Some relays controlled by the BCM are switched ignition voltage outputs that are pass through circuits within the BCM directly from the ignition switch. If these circuits short to ground, the B+ circuit fuse to the ignition switch will open.

With BTM

The vehicle ON/OFF switch has a single LED that indicate the vehicle power mode. When the vehicle is in the off mode, the LED is not illuminated. Pressing and holding the vehicle ON/OFF switch up to 10 s, without the brake pedal applied, will enter the Vehicle Service Mode and the LED will illuminate. With the vehicle OFF and the brake pedal applied, pressing the vehicle ON/OFF switch once, the vehicle will enter the Vehicle ON mode and the LED will illuminate.

The vehicle ON/OFF switch contains two individual switches that provides redundant switch inputs to both the body control module (BCM) and the keyless entry

control module. The BCM supplies the vehicle ON/OFF switch a constant B+ signal. The BCM monitors this signal to determine if the switch is released or pressed. When the vehicle ON/OFF switch is not pressed, voltage on the signal circuit is pulled down through two resistors in the switch. When the vehicle ON/OFF switch is pressed, voltage on the signal circuit is pulled down through only one resistor, changing the voltage seen at the BCM and indicating that the vehicle ON/OFF switch is pressed.

The keyless entry control module monitors voltage on the switch in the same manner as the BCM, but monitors the s switch located in the vehicle ON/OFF switch. The keyless entry control module also controls the backup power for the ignition run relay through the control circuit by applying voltage to the ignition voltage circuit. This circuit is a pass-thru in the BCM and will energize the ignition circuit when the vehicle is in Service Mode, the vehicle is ON, or when a remote start is requested.

Reference Information

Schematic Reference

- *Power Distribution Schematics on page 11-314*
- *Power Moding Schematics on page 11-327*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Mode Description and Operation on page 11-958

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Without BTM

1. Verify DTC U1814 is not set.

⇒ **If DTC is set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If DTC is not set**

2. Vehicle in Service Mode.
3. Verify the scan tool power mode parameters change when cycling the S39 Ignition Switch between OFF, Accessory, ON, and Start.

⇒ **If the power mode parameters do not change**

Refer to Circuit/System Testing.

⇓ **If the power mode parameters change**

4. All OK.

With BTM

1. Verify DTC B097B 61 is not set.

⇒ **If DTC B097B 61 is set**

Test or replace the S83 Vehicle On/Off Switch.

⇓ **If DTC B097B 61 is not set**

2. Refer to Circuit/System Testing.

Circuit/System Testing

Without BTM

1. Vehicle OFF, disconnect the S39 Ignition Switch.
2. Verify a test lamp illuminates between the B+ circuit terminal 5 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

2.1. Remove the test lamp.

2.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is good and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

2.1. Remove the test lamp.

2.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on one of the following circuits listed below:

Note: To help isolate a short to ground, it may be necessary to disconnect modules that are connected to the following circuits:

- B+ circuit terminal 5
- Ignition circuit terminal 3
- Ignition circuit terminal 4
- Ignition circuit terminal 6

⇓ **If the test lamp illuminates**

3. Connect the S39 Ignition Switch.
4. Vehicle in Service Mode, disconnect the harness connector at the S39 Ignition Switch while the in Vehicle in Service Mode.
5. Test for 4.8–5.2 V between the 5 V reference circuit terminal 2 and ground.

⇒ **If less than 4.8 V**

5.1. Connect the S39 Ignition Switch.

5.2. Vehicle OFF, disconnect the X3 harness connector at the K9 Body Control Module and S39 Ignition Switch.

5.3. Test for infinite resistance between the 5 V reference circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

5.4. Test for less than 2 Ω in the 5 V reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If greater than 5.2 V**

5.1. Connect the S39 Ignition Switch.

5.2. Vehicle OFF, disconnect the X3 harness connector at the K9 Body Control Module.

5.3. Vehicle in Service Mode, disconnect the harness connector at the S39 Ignition Switch while the in Vehicle in Service Mode.

5.4. Test for less than 1 V between the 5 V reference circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If between 4.8–5.2 V**

6. Connect the S39 Ignition Switch.
7. Vehicle OFF.
8. Disconnect the X3 harness connector at the K9 Body Control Module, Vehicle in Service Mode.
9. Verify a test lamp illuminates between each of the ignition circuits listed below and ground:
   - Ignition circuit terminal 5
   - Ignition circuit terminal 6

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

9.1. Vehicle OFF remove the test lamp.

9.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is good and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

9.1. Vehicle OFF remove the test lamp.

9.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

10. Vehicle OFF with the key in.
11. Verify a test lamp illuminates between ignition circuit terminal 15 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

11.1. Vehicle OFF with the key out, remove the test lamp.

11.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is good and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

11.1. Vehicle OFF with the key out remove the test lamp.

11.2. Test for infinite resistance between the ignition circuit terminal 15 and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

12. Connect the X3 harness connector at the K9 Body Control Module, Vehicle in Service Mode.
13. Disconnect the S39 Ignition Switch.
14. Test for less than 1 V between each of the ignition circuits listed below and ground.
    - Ignition circuit terminal 3
    - Ignition circuit terminal 4
    - Ignition circuit terminal 6

⇒ **If 1 V or greater**

Repair the short to voltage on the circuit.

⇓ **If less than 1 V**

15. Test or replace the S39 Ignition Switch.

With BTM

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S83 Vehicle On/Off Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.

⇒ **If 10 Ω or greater**

2.1. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Test for less than 10 Ω between the low reference circuit terminal 7 and ground.

⇒ **If 10 Ω or greater**

3.1. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K84 Keyless Entry Control Module.

⇓ **If less than 10 Ω**

4. Connect the S83 Vehicle On/Off Switch, Vehicle in Service Mode.
5. Disconnect the S83 Vehicle On/Off Switch.
6. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is greater than 11 V.

⇒ **If 11 V or less**

6.1. Connect the S83 Vehicle On/Off Switch.

6.2. Vehicle OFF, disconnect the X2 harness connector at the K9 Body Control Module and S83 Vehicle On/Off Switch.

6.3. Test for infinite resistance between the signal circuit terminal 6 and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K9 Body Control Module.

⇓ **If greater than 11 V**

7. Install a 3 A fused jumper wire between the signal circuit terminal 6 and ground.
8. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is less than 1 V.

⇒ **If 1 V or greater**

8.1. Disconnect the harness connector at the K9 Body Control Module.

8.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇓ If less than 1 V

8.3. Test for less than 2 Ω in signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If less than 1 V**

9. Connect the harness connector at the S83 Vehicle On/Off Switch.
10. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is 8–10 V, with the S83 Vehicle On/Off Switch released.

⇒ **If not between 8–10 V**

Test or replace the S83 Vehicle On/Off Switch.

⇓ **If between 8–10 V**

11. Verify the scan tool K9 Body Control Module Push Button Ignition Switch Voltage parameter is 4–7 V, with the S83 Vehicle On/Off Switch pressed.

⇒ **If not between 4–7 V**

Test or replace the S83 Vehicle On/Off Switch.

⇓ **If between 4–7 V**

12. Disconnect the X1 harness connector at the K84 Keyless Entry Control Module.
13. Test for infinite resistance between the signal circuit terminal 11 and ground.

⇒ **If less than infinite resistance**

Repair the short to ground on the circuit.

⇓ **If infinite resistance**

14. Vehicle in Service Mode.
15. Test for less than 1 V between the signal circuit terminal 11 and ground.

⇒ **If 1 V or greater**

Repair the short to voltage on the circuit.

⇓ **If less than 1 V**

16. Test for 4.5–5.5 k Ω between the signal circuit terminal 11 and the low reference circuit terminal 12, with the S83 Vehicle On/Off Switch released.

⇒ **If not between 4.5–5.5 k Ω**

16.1. Vehicle OFF, disconnect the harness connector at the S83 Vehicle On/Off Switch.

16.2. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, test or replace the S83 Vehicle On/Off Switch.

⇓ **If between 4.5–5.5 k Ω**

17. Test for 1–1.5 k Ω between the signal circuit terminal 11 and the low reference circuit terminal 12, with the S83 Vehicle On/Off Switch pressed.

⇒ **If not between 1–1.5 k Ω**

Test or replace the S83 Vehicle On/Off Switch.

⇓ **If between 1–1.5 k Ω**

18. Replace the K84 Keyless Entry Control Module.

Component Testing

S39 Ignition Switch

1. Vehicle OFF, disconnect the X1 harness connector at the S39 Ignition Switch.
2. Using the Resistance Test below, verify the resistance between the terminals listed below match for each S39 Ignition Switch Position.

⇒ **If any reading is other than specified**

Replace the S39 Ignition Switch.

⇓ **If the readings match**

3. All OK.

Resistance Test

Ignition Switch Position	Terminals 1 and 2	Terminals 2 and 3	Terminals 2 and 4	Terminals 2 and 6	Terminals 4 and 6
OFF Key Out	Infinite	Infinite	Infinite	Infinite	Infinite
OFF Key In	Infinite	Infinite	<5.0 Ω	Infinite	Infinite
Accessory	Infinite	<5.0 Ω	Infinite	Infinite	Infinite
Run	<5.0 Ω	<5.0 Ω	Infinite	Infinite	<5.0 Ω
Start	<5.0 Ω	Infinite	Infinite	Infinite	1275–1325 Ω

Vehicle ON/OFF Switch

1. Vehicle OFF, disconnect the harness connector at the S83 Vehicle ON/OFF Switch.
2. Test for 4.5–5.5 k Ω between the terminal listed below with the S83 Vehicle ON/OFF Switch released:
   - Signal terminal 6 and ground terminal 4
   - Signal terminal 3 and low reference terminal 7

⇒ **If not between 4.5–5.5 k Ω**

Replace the S83 Vehicle On/Off Switch.

⇓ **If between 4.5–5.5 k Ω**

3. Test for 1–1.5k Ω between the terminals listed below with the S83 Vehicle On/Off Switch pressed:
   - Signal terminal 6 and ground terminal 4
   - Signal terminal 3 and low reference terminal 7

⇒ **If not between 1–1.5 k Ω**

Replace the S83 Vehicle On/Off Switch.

⇓ **If between 1–1.5 k Ω**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Ignition and Start Switch Replacement on page 11-957*
- *Control Module References on page 6-3* for the appropriate control module replacement, programming and setup.

General Electrical Diagnosis

Basic Knowledge Required

Without a basic knowledge of electricity, it will be difficult to use the diagnostic procedures contained in the service manual. You should understand the basic theory of electricity, and know the meaning of voltage (V), current (A), and resistance (Ω). You should also be able to read and understand a wiring diagram, as well as understand what happens in a circuit with an open or a shorted wire.

Checking Aftermarket Accessories

Warning: Refer to SIR Warning on page 0-7.

Do not connect aftermarket accessories into the SIR circuits, all such circuits are indicated on circuit diagrams with the SIR symbol.

Always check for aftermarket accessories (non-OEM) as the first step in diagnosing electrical problems. If the vehicle is so equipped, disconnect the system to verify that these add-on accessories are not the cause of the problems.

Possible causes of vehicle problems related to aftermarket accessories include:

- Power feeds connected to points other than the battery
- Antenna location
- Transceiver wiring located too close to vehicle electronic modules or wiring
- Poor shielding or poor connectors on antenna feed line
- Check for recent service bulletins detailing installation guidelines for aftermarket accessories.

Circuit Testing

The Circuit Testing section contains the following diagnostic testing information. Using this information along with the diagnostic procedures will identify the cause of the electrical malfunction.

- *Using Connector Test Adapters on page 11-872*
- *Probing Electrical Connectors on page 11-872*
- *Troubleshooting with a Digital Multimeter on page 11-873*
- *Troubleshooting with a Test Lamp on page 11-874*
- *Using Fused Jumper Wires on page 11-874*
- *Measuring Voltage on page 11-875*
- *Measuring Voltage Drop on page 11-875*
- *Measuring Frequency on page 11-875*
- *Testing Ground and Low Reference Circuits on page 11-876*
- *Testing for Continuity on page 11-876*
- *Testing for Short to Ground on page 11-877*
- *Testing for a Short to Voltage on page 11-877*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Inducing Intermittent Fault Conditions on page 11-879*
- *Testing for Electrical Intermittents on page 11-880*
- *Scan Tool Snapshot Procedure on page 11-881*
- *Circuit Protection - Fuses on page 11-882*
- *Circuit Protection - Circuit Breakers on page 11-883*
- *Circuit Protection - Fusible Links on page 11-883*

Using Connector Test Adapters

Special Tools

EL-35616 Terminal Test Probe Kit

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Danger: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

Caution: Do not insert test equipment probes (DMM etc.) into any connector or fuse block terminal. The diameter of the test probes will deform most terminals. A deformed terminal will cause a poor connection, which will result in a system failure. Always use the J-35616-F GM Approved Terminal Release Tool Kit in order to front probe terminals. Do not use paper clips or other substitutes to probe terminals.

When using the J-35616-F GM Approved Terminal Release Tool Kit , ensure the terminal test adapter choice is the correct size for the connector terminal. Do not visually choose the terminal test adapter because some connector terminal cavities may appear larger than the actual terminal in the cavity. Using a larger terminal test adapter will damage the terminal. Refer to the J-35616-F GM Approved Terminal Release Tool Kit label on the inside of the J-35616-F GM Approved Terminal Release Tool Kit for the correct adapter along with the connector end view for terminal size.

Probing Electrical Connectors

Special Tools

EL-35616 Terminal Test Probe Kit

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Danger: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

Note: Always be sure to reinstall the connector position assurance (CPA) and terminal position assurance (TPA) when reconnecting connectors or replacing terminals.

Front probe

Disconnect the connector and probe the terminals from the mating side (front) of the connector.

Caution: Refer to *Test Probe Caution on page 0-9*.

Note: When probing female 0.64 terminals, it is important to use the correct adapter. There have been some revisions to the test adapter for 0.64 terminals. The proper adapter for 0.64 terminals is the J-35616-64B which has a gold terminal and a black wire between the base and tip. Failure to use the proper test adapter may result in damage to the terminal being tested and improper diagnosis.

Note: The proper adapter for probing the terminals for fuses, relays, or diodes in an electrical center is J-35616-35. Using any other tool or adapter may damage the terminal being tested.

Refer to the following table as a guide in selecting the correct test adapter for front probing connectors:

Test Adapter	Description
J-35616-2A	150 Male Probe Adapter (gray)
J-35616-3	150 Female Probe Adapter (gray)
J-35616-4A	280 Male Probe Adapter (purple)
J-35616-5	280 Female Probe Adapter (purple)
J-35616-6	100W Male (round) Probe Adapter (brown)
J-35616-7	100W Female (round) Probe Adapter (brown)
J-35616-8	Weather Pack Male Probe Adapter (orange)
J-35616-9	Weather Pack Female Probe Adapter (orange)
J-35616-10	100W Male (round) Probe Adapter (green)
J-35616-11	100W Female (round) Probe Adapter (green)
J-35616-12	130 Male Probe Adapter (blue)
J-35616-13	130 Female Probe Adapter (blue)
J-35616-14	150 Male Probe Adapter (green)
J-35616-16	100 Male Probe Adapter (lt green)
J-35616-17	100 Female Probe Adapter (lt green)
J-35616-18	220 Male Probe Adapter (black)
J-35616-19	220 Female Probe Adapter (black)
J-35616-21	950 Female Probe Adapter (red)
J-35616-22	950 Male Probe Adapter (red)
J-35616-31	500 Male Probe Adapter (orange)

Test Adapter	Description
J-35616-32	500 Female Probe Adapter (orange)
J-35616-33	160/180 Male Probe Adapter (yellow)
J-35616-34	160/180 Female Probe Adapter (yellow)
J-35616-35	280 Male Probe Adapter (violet)
J-35616-40	480 Male Probe Adapter (dk blue)
J-35616-41	480 Female Probe Adapter (dk blue)
J-35616-42	630 Male Probe Adapter (red)
J-35616-43	630 Female Probe Adapter (red)
J-35616-44	800 Male Probe Adapter (yellow)
J-35616-45	800 Female Probe Adapter (yellow)
J-35616-54	280 Male (round) Probe Adapter (tan)
J-35616-55	280 Female (round) Probe Adapter (tan)
J-35616-64B	0.64 Male Probe Adapter (lt blue)
J-35616-65B	0.64 Female Probe Adapter (lt blue)
J-35616-66	150 Male (round) Probe Adapter (yellow)
J-35616-67	150 Female (round) Probe Adapter (yellow)

Backprobe

Note:

- Backprobe connector terminals only when specifically required in diagnostic procedures.
- Do not backprobe a sealed (Weather Pack®) connector, less than a 280 series Metri-Pack connector, a Micro-Pack connector, or a flat wire connector.
- Backprobing can be a source of damage to connector terminals. Use care in order to avoid deforming the terminal, either by forcing the test probe too far into the cavity or by using too large of a test probe.
- After backprobing any connector, inspect for terminal damage. If terminal damage is suspected, test for proper terminal contact.

Do not disconnect the connector and probe the terminals from the harness side (back) of the connector.

Troubleshooting with a Digital Multimeter

Special Tools

EL-39200 Digital Multimeter (DMM)

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Danger: High voltage circuits should only be tested using a digital multimeter (DMM) and test leads with at least a CAT III rating, such as the J 39200-A Digital Multimeter. Failure to follow the procedures may result in serious injury or death.

Caution: Refer to *Test Probe Caution on page 0-9*.

Digital Multimeter (DMM) Basic Requirements

Service information is validated using digital multimeters that meet or exceed the following requirements. Using a multimeter that does not meet these basic requirements may give inaccurate readings which could lead to an incorrect diagnosis.

Display and Settings

1. Four digits displayed
2. Voltage, current, resistance, frequency, diode test settings, and min-max function
3. Display positive and negative values

Voltage

1. Have at least 10 M Ω input impedance
2. Test a DC voltage range of 0.1–1000 V.
3. Test an AC voltage range of 0.1–1000 V.

Current

1. Test a DC current range of 0.1µA–10 A.
2. Test an AC current range of 0.1µA–10 A.

Resistance

Test a resistance range of 0.1 Ω–40 MΩ and displays infinite for a value greater than 40 M Ω (O.L. (Over-load))

Frequency

Test for a frequency range of 0.5 HZ–199 K HZ

Diode Test

1. Apply at least 2 mA when performing the diode bias test
2. Display the break over voltage drop (0–3 V) of a forward biased diode
3. Display infinite (O.L. (Over-load)) when a diode is reverse biased

Min-Max Readings

1. Can update at a 25 ms sample rate
2. Saves and displays minimum and maximum values

Note: Circuits which include any solid state control modules, such as the engine control module (ECM), should only be tested with a 10 megohm or higher impedance digital multimeter such as the EL-39200.

The DMM instruction manual is a good source of information and should be read thoroughly upon receipt of the DMM as well as kept on hand for future reference.

A DMM should be used instead of a test lamp in order to test for voltage in high impedance circuits. While a test lamp shows whether voltage is present if the impedance is low enough, a DMM indicates how much voltage is present. In other words, if there is not enough current, the test lamp will not illuminate even though voltage is present.

The ohmmeter function on a DMM shows how much resistance exists between 2 points along a circuit. Low resistance in a circuit means good continuity.

Note: Disconnect the power feed from the suspect circuit when measuring resistance with a DMM. This prevents incorrect readings. DMMs apply such a small voltage to measure resistance that the presence of voltages can upset a resistance reading.

Diodes and solid state components in a circuit can cause a DMM to display a false reading. To find out if a component is affecting a measurement take a reading once, then reverse the leads and take a second reading. If the readings differ the solid state component is affecting the measurement.

Following are examples of the various methods of connecting the DMM to the circuit to be tested:

- Probe both ends of the connector and either hold the leads in place while manipulating the connector or tape the leads to the harness for continuous monitoring while you perform other operations or test driving. Refer to *Probing Electrical Connectors on page 11-872*.
- Disconnect the harness at both ends of the suspected circuit where it connects either to a component or to other harnesses.
- If the system that is being diagnosed has a specified pinout or breakout box, it may be used in order to simplify connecting the DMM to the circuit or for testing multiple circuits quickly.

Troubleshooting with a Test Lamp

Special Tools

EL-35616-200 Test Light – Probe Kit

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Danger: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

Caution: Refer to *Test Probe Caution on page 0-9*.

A test lamp can simply and quickly test a low impedance circuit for voltage. A digital multimeter (DMM) should be used instead of a test lamp in order to test for voltage in high impedance circuits. While a test lamp shows whether voltage is present if the impedance is low enough, a DMM indicates how much voltage is present. In other words, if there is not enough current, the test lamp will not illuminate even though voltage is present.

The *EL-35616-200* kit is Micro-Pack compatible and comprised of a 12 V light bulb with an attached pair of leads.

To properly operate this tool use the following procedures.

When testing for voltage:

1. Attach one lead to ground.
2. Touch the other lead to various points along the circuit where voltage should be present.
3. When the bulb illuminates, there is voltage at the point being tested.

When testing for ground:

1. Attach one lead to battery positive voltage.
2. Touch the other lead to various points along the circuit where ground should be present.
3. When the bulb illuminates, there is ground at the point being tested.

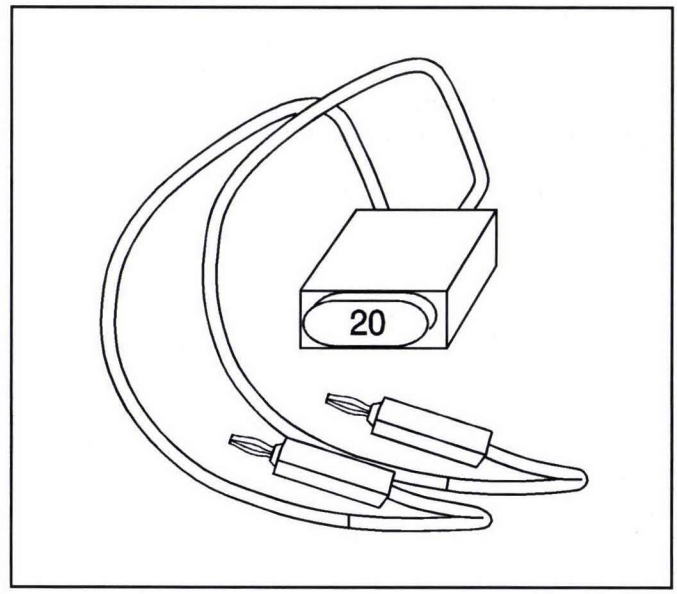
Using Fused Jumper Wires

Special Tools

EL 35616-20F Fused Jumper Wire

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Note: A fused jumper may not protect solid state components from being damaged.



2389094

The *EL 35616-20F* Fused Jumper Wire includes banana jack connectors that provide adaptation to most connectors without damage. This fused jumper wire is

supplied with a 20 A fuse which may not be suitable for some circuits. Do not use a fuse with a higher rating than the fuse that protects the circuit being tested.

Measuring Voltage

Special Tools

EL-39200 Digital Multimeter (DMM)

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Danger: Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 50 feet of the vehicle, either indoors or outdoors***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedure exactly as written may result in serious injury or death.

Caution: Refer to *Test Probe Caution on page 0-9*.

The following procedure measures the voltage at a selected point in a circuit.

1. Disconnect the electrical harness connector for the circuit being tested, if necessary.
2. Enable the circuit and/or system being tested. Use the following methods:
   - Vehicle power mode to Vehicle in Service Mode or Vehicle On.
   - Turn ON the circuit and/or system with a scan tool in Output Controls.
   - Turn ON the switch for the circuit and/or system being tested.
3. Select the V (AC) or V (DC) position on the digital multimeter (DMM).
4. Connect the positive lead of the DMM to the point of the circuit to be tested.
5. Connect the negative lead of the DMM to a good ground.
6. The DMM displays the voltage measured at that point.

Measuring Voltage Drop

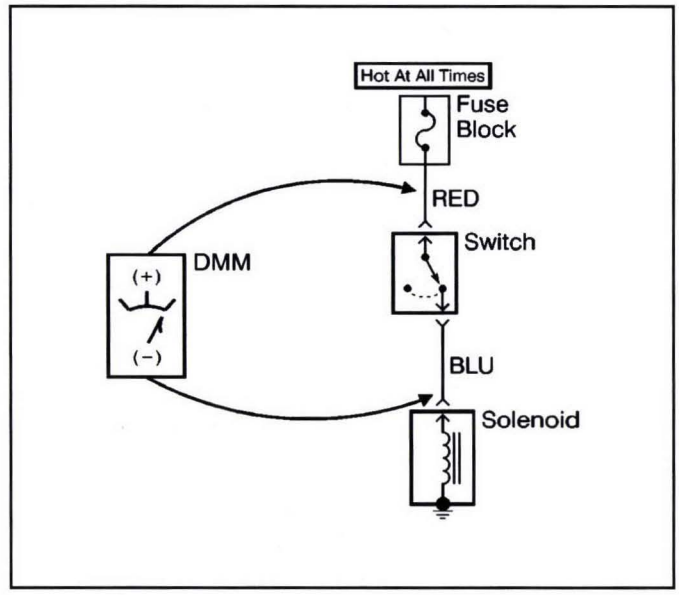
Special Tools

EL–39200 Digital Multimeter (DMM)

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Caution: Refer to *Test Probe Caution on page 0-9*.

The following procedure determines the difference in voltage potential between 2 points.



61704

1. Set the Digital Multimeter (DMM) to the V (DC) position.
2. Connect the positive lead of the DMM to one point of the circuit to be tested.
3. Connect the negative lead of the DMM to the other point of the circuit.
4. Operate the circuit.
5. The DMM displays the difference in voltage between the 2 points.

Measuring Frequency

Special Tools

EL–39200 Digital Multimeter (DMM)

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Caution: Refer to *Test Probe Caution on page 0-9*.

The following procedure determines the frequency of a signal.

Note: Connecting the Digital Multimeter (DMM) to the circuit before pressing the Hz button will allow the DMM to autorange to an appropriate range.

1. Apply power to the circuit.
2. Set the DMM to the V (AC) position.
3. Connect the positive lead of the DMM to the circuit to be tested.
4. Connect the negative lead of the DMM to a good ground.
5. Set to Hz on the DMM.
6. The DMM will display the frequency measured.

Testing Ground and Low Reference Circuits

Because a test lamp can light with up to 200 Ω in a ground or low reference circuit they are not recommended to be used for this type of test. A low impedance test lamp can light and indicate the circuit is good when there is as much as 20–30 Ω present, while a high impedance test lamp can light with up to 200 Ω present in the circuit. This is why the Digital Multi-Meter (DMM) is used when validating a ground or low reference circuit continuity.

When using the DMM there are many vehicle conditions that can affect the ground and low reference continuity testing. If these conditions are not met, a ground or low reference circuit test can fail on a good circuit. This may cause longer diagnosis time and incorrect component replacement.

Any current flow through a ground or low reference circuit, while being tested, will skew the DMM continuity reading, or display a reading higher than when there is no current flowing. Performing a ground or low reference circuit continuity test, in reference to the vehicles battery negative terminal, will have the highest risk of failing a good ground or low reference circuit test than any other ground reference point. The best ground test points would be a control module housing (if the control modules housing is metal and grounded), door jamb striker (if attached to metal), under dash metal frame work, engine block, or body ground studs (other than where the negative battery cable is attached).

A typical DMM ground or low reference circuit continuity reading can be as high as 100 Ω with the vehicle power mode in Vehicle ON or Vehicle in Service Mode, and drop to 15–25 Ω after switching the vehicle off. The reading will drop below 10 Ω after 30–40 s, then below 5 Ω after 60 s. Once the vehicle completely goes to sleep (generally 3-10 min) the reading will drop below 0.3 Ω.

The following list of conditions may need to be met to ensure a valid continuity reading on a ground or low reference circuit:

- Vehicle off
- Transmitter out of range of the vehicle
- Retained Accessory Power off (open and close the driver door after vehicle off)
- Battery charger set at a 2 A or less charge rate
- Scan tool not communicating with any vehicle control module (in some cases it may need to be disconnected from the DLC)
- All entry doors closed
- Headlamps off(auto headlamps disabled)
- Any delay lighting off
- HVAC after blow off
- Any accessory that can work when the vehicle power mode is Vehicle OFF
- Wait up to 60 s (after all other listed conditions are met)

Locking the doors with a remote transmitter can greatly reduce the time to achieve a valid ground or low reference continuity test result.

There are some low reference circuits that use a driver to isolate the circuit while the ignition is off. This is done in most cases for accidental reverse battery connections or reverse polarity jump starting. When this driver is present, the ignition will need to be on to validate the circuit.

Testing for Continuity

Special Tools

EL-39200 Digital Multimeter (DMM)

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Danger: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

Caution: Refer to *Test Probe Caution on page 0-9*.

The following procedures verify good continuity in a circuit.

With a Digital Multimeter (DMM)

1. Set the DMM to the Ω position.
2. Disconnect the power feed (i.e. fuse, control module) from the suspect circuit.
3. Disconnect the load.
4. Select the MIN MAX function on the DMM.
5. Connect one lead of the DMM to one end of the circuit to be tested.
6. Connect the other lead of the DMM to the other end of the circuit.
7. If the DMM displays low or no resistance, the circuit has good continuity.

With a Test Lamp

Note: Only use the test lamp procedure on low impedance power and ground circuits.

1. Remove the power feed (i.e. fuse, control module) from the suspect circuit.
2. Disconnect the load.
3. Connect one lead of the test lamp to one end of the circuit to be tested.
4. Connect the other lead of the test lamp to battery positive voltage.
5. Connect the other end of the circuit to ground.
6. If the test lamp illuminates (full intensity), then the circuit has good continuity.

Testing for Short to Ground

Danger: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

Caution: Refer to *Test Probe Caution on page 0-9*.

The following procedures test for a short to ground in a circuit.

With a Digital Multimeter (DMM)

1. Remove the power feed (i.e. fuse, control module) from the suspect circuit.
2. Disconnect the load.
3. Set the rotary dial of the DMM to the Ω position.
4. Connect one lead of the DMM to one end of the circuit to be tested.
5. Connect the other lead of the DMM to a good ground.
6. If the DMM does NOT display infinite resistance (OL), there is a short to ground in the circuit.

With a Test Lamp

1. Remove the power feed (i.e. fuse, control module) from the suspect circuit.
2. Disconnect the load.
3. Connect one lead of the test lamp to battery positive voltage.
4. Connect the other lead of the test lamp to one end of the circuit to be tested.
5. If the test lamp illuminates, there is a short to ground in the circuit.

Fuse Powering Several Loads

1. Review the system schematic and locate the fuse that is open.
2. Open the first connector or switch leading from the fuse to each load.
3. Connect a DMM across the fuse terminals (be sure that the fuse is powered).
   - When the DMM displays voltage the short is in the wiring leading to the first connector or switch.
   - If the DMM does not display voltage refer to the next step.
4. Close each connector or switch until the DMM displays voltage in order to find which circuit is shorted.

Testing for a Short to Voltage

Special Tools

EL-39200 Digital Multimeter (DMM)

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Danger: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

Caution: Refer to *Test Probe Caution on page 0-9*.

The following procedure tests for a short to voltage in a circuit.

1. Remove the power feed (i.e. fuse, control module) from the suspect circuit.
2. Disconnect the load.
3. Set the digital multimeter (DMM) to the V (DC) position.
4. Connect the positive lead of the DMM to one end of the circuit to be tested.
5. Connect the negative lead of the DMM to a good ground.
6. Switch the vehicle power mode to Vehicle in Service Mode and operate all accessories.
7. If the voltage measured is greater than 1 V, there is a short to voltage in the circuit.

Testing for Intermittent Conditions and Poor Connections

Special Tools

EL-35616 Terminal Test Probe Kit

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Danger: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

When the condition is not currently present, but is indicated in DTC history, the cause may be intermittent. An intermittent may also be the cause when there is a customer complaint, but the symptom cannot be duplicated. Refer to the Symptom Table of the system that is suspect of causing the condition before trying to locate an intermittent condition.

Most intermittent conditions are caused by faulty electrical connections or wiring. Inspect for the following items:

- Wiring broken inside the insulation
- Poor connection between the male and female terminal at a connector
- Poor terminal to wire connection—Some conditions which fall under this description are poor crimps, poor solder joints, crimping over the wire insulation rather than the wire itself, and corrosion in the wire to terminal contact area, etc.
- Pierced or damaged insulation can allow moisture to enter the wiring causing corrosion. The conductor can corrode inside the insulation, with little visible evidence. Look for swollen and stiff sections of wire in the suspect circuits.
- Wiring which has been pinched, cut, or its insulation rubbed through may cause an intermittent open or short as the bare area touches other wiring or parts of the vehicle.
- Wiring that comes in contact with hot or exhaust components
- Refer to *Inducing Intermittent Fault Conditions on page 11-879* in order to duplicate the conditions required, in order to verify the customer concern.

- Refer to *Testing for Electrical Intermittents on page 11-880* for test procedures to detect intermittent open, high resistance, short to ground, and short to voltage conditions.
- Refer to *Scan Tool Snapshot Procedure on page 11-881* for advanced intermittent diagnosis and Vehicle Data Recorder operation.

Testing for Terminal Fretting

Some intermittent conditions can be caused by wire terminal fretting corrosion. Fretting corrosion is a build-up of insulating, oxidized wear debris that can form when there is a small motion between electrical contacts. The oxidized wear debris can pile up enough at the electrical contact spots that the electrical resistance across the connection increases. Movement between the contacting surfaces as small as 10 to 100 microns can cause fretting. To put this in perspective, a sheet of paper is about 100 microns thick, so fretting motion is small and hard to see. Vibration and thermal expansion/contraction are the main sources that create fretting motion. Since vehicles vibrate and can experience large temperature swings, they are a good source for fretting motion. Tin, copper, nickel, and iron surfaces are all susceptible to fretting corrosion. Fretting corrosion can be difficult to see but it looks like small, dark smudges on the terminals contact surface.

To correct a fretting condition disconnect the suspect connector and add dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087) to both sides of the connector terminals. Then reconnect the connector and wipe away any excess lubricant. This will correct the additional terminal contact resistance due to the terminal fretting corrosion.

Testing for Proper Terminal Contact

It is important to test terminal contact at the component and any inline connectors before replacing a suspect component. Mating terminals must be inspected to ensure good terminal contact. A poor connection between the male and female terminal at a connector may be the result of contamination or deformation.

Contamination may be caused by the connector halves being improperly connected. A missing or damaged connector seal, damage to the connector itself, or exposing the terminals to moisture and dirt can also cause contamination. Contamination, usually in the underhood or underbody connectors, leads to terminal corrosion, causing an open circuit or intermittently open circuit.

Deformation is caused by probing the mating side of a connector terminal without the proper adapter. Always use the *EL-35616* kit when probing connectors. Other causes of terminal deformation are improperly joining the connector halves, or repeatedly separating and joining the connector halves. Deformation, usually to the female terminal contact tang, can result in poor terminal contact causing an open or intermittently open circuit.

Testing for Proper Terminal Contact in Bussed Electrical Centers (BEC)

It is very important to use the correct test adapter when testing for proper terminal contact of fuses and relays in a bussed electrical center (BEC). Use *EL-35616* kit to test for proper terminal contact. Failure to use *EL-35616* kit can result in improper diagnosis of the bussed electrical center.

Follow the procedure below in order to test terminal contact:

1. Separate the connector halves.
2. Visually inspect the connector halves for contamination. Contamination may result in a white or green build-up within the connector body or between terminals. This causes high terminal resistance, intermittent contact, or an open circuit. An underhood or underbody connector that shows signs of contamination should be replaced in its entirety: terminals, seals, and connector body.
3. Using an equivalent male terminal/terminated lead, verify that the retention force is significantly different between a known good terminal and the suspect terminal. Replace the female terminal in question.

Flat Wire Connectors

There are no serviceable parts for flat wire connectors on the harness side or the component side.

Follow the procedure below in order to test terminal contact:

1. Remove the component in question.
2. Visually inspect each side of the connector for signs of contamination. Avoid touching either side of the connector as oil from your skin may be a source of contamination as well.
3. Visually inspect the terminal bearing surfaces of the flat wire circuits for splits, cracks, or other imperfections that could cause poor terminal contact. Visually inspect the component side connector to ensure that all of the terminals are uniform and free of damage or deformation.
4. Insert the appropriate adapter from the on the flat wire harness connector in order to test the circuit in question.

Control Module/Component Voltage and Grounds

Poor voltage or ground connections can cause widely varying symptoms.

- Test all control module voltage supply circuits. Many vehicles have multiple circuits supplying voltage to a control module. Other components in the system may have separate voltage supply circuits that may also need to be tested. Inspect connections at the module/component connectors, fuses, and any intermediate connections between the voltage source and the module/component. A test lamp or a DMM may indicate that voltage is present, but neither tests the ability of the circuit to carry sufficient current. Operate the component to test the ability of the circuit to carry sufficient current. Refer to *Circuit Testing on page 11-871* and *Power Distribution Schematics on page 11-314*.
- Test all control module ground and system ground circuits. The control module may have multiple ground circuits. Other components in the system may have separate grounds that may also need to be tested. Inspect grounds for clean and tight

connections at the grounding point. Inspect the connections at the component and in splice packs, where applicable. Operate the component to test the ability of the circuit to carry sufficient current. Refer to *Circuit Testing on page 11-871* and *Ground Distribution Schematics on page 11-333*.

Temperature Sensitivity

- An intermittent condition may occur when a component/connection reaches normal operating temperature. The condition may occur only when the component/connection is cold, or only when the component/connection is hot.
- Freeze Frame, Failure Records, Snapshot, or Vehicle Data Recorder data may help with this type of intermittent condition, where applicable.
- If the intermittent is related to heat, review the data for a relationship with the following:
  - High ambient temperatures
  - Underhood/engine generated heat
  - Circuit generated heat due to a poor connection, or high electrical load
  - Higher than normal load conditions, towing, etc.
- If the intermittent is related to cold, review the data for the following:
  - Low ambient temperatures—In extremely low temperatures, ice may form in a connection or component. Inspect for water intrusion.
  - The condition only occurs on a cold start.
  - The condition goes away when the vehicle warms up.
- Information from the customer may help to determine if the trouble follows a pattern that is temperature related.
- If temperature is suspected of causing an intermittent fault condition, attempt to duplicate the condition. Refer to *Inducing Intermittent Fault Conditions on page 11-879* in order to duplicate the conditions required.

Electromagnetic Interference and Electrical Noise

Some electrical components/circuits are sensitive to electromagnetic interference (EMI) or other types of electrical noise. Inspect for the following conditions:

- A mis-routed harness that is too close to high voltage/high current devices such as secondary ignition components, motors, generator, etc .— These components may induce electrical noise on a circuit that could interfere with normal circuit operation.
- Electrical system interference caused by a malfunctioning relay, or a control module driven solenoid or switch — These conditions can cause a sharp electrical surge. Normally, the condition will occur when the malfunctioning component is operating.
- Improper installation of non-factory or aftermarket add on accessories such as lights, 2-way radios, amplifiers, electric motors, remote starters, alarm systems, cell phones, etc. — These accessories may create interference in other circuits while operating and the interference would disappear when the accessory is not operating. Refer to *Checking Aftermarket Accessories on page 11-871*.
- Test for an open diode across the A/C compressor clutch and for other open diodes. Some relays may contain a clamping diode.
- The generator may be allowing AC noise into the electrical system.

Incorrect Control Module

- There are only a few situations where reprogramming a control module is appropriate:
  - A new service control module is installed.
  - A control module from another vehicle is installed.
  - Revised software/calibration files have been released for this vehicle.

  Note: DO NOT re-program the control module with the SAME software/calibration files that are already present in the control module. This is not an effective repair for any type of concern.
- Verify that the control module contains the correct software/calibration. If incorrect programming is found, reprogram the control module with the most current software/calibration. Refer to *Control Module References on page 6-3* for replacement, setup, and programming.

Inducing Intermittent Fault Conditions

Special Tools

EL-25070 Heat Gun

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Danger: Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- ***Safety glasses with appropriate side shields when within 50 feet of the vehicle, either indoors or outdoors***
- ***Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors***
  - ***Visually and functionally inspect the gloves before use.***
  - ***Wear the Insulation gloves at all times when working with the high voltage battery assembly, whether the system is energized or not.***

Failure to follow the procedure exactly as written may result in serious injury or death.

Many intermittent open or shorted circuits are affected by harness/connector movement that is caused by vibration, torque, bumps/rough pavement, etc. In order to duplicate the customer's concern, it may be necessary to manipulate the wiring harness if the

malfunction appears to be vibration related. Manipulation of a circuit can consist of a wide variety of actions, including:

- Wiggling the harness
- Disconnecting a connector and reconnecting
- Stressing the mechanical connection of a connector
- Pulling on the harness or wire in order to identify a separation/break inside the insulation
- Relocating a harness or wires

All these actions should be performed with some goal in mind. For instance, with a scan tool connected, wiggling the wires may uncover a faulty input to the control module. The snapshot option would be appropriate here. Refer to *Scan Tool Snapshot Procedure on page 11-881*. Another option is, with the component commanded ON and OFF by the scan tool, to move related connectors and wiring and observe the component operation. With the vehicle ON, move related connectors and wiring while monitoring vehicle operation. If harness or connector movement affects the data displayed, component/system operation, or vehicle operation, inspect and repair the harness/ connections as necessary.

You may need to load the vehicle in order to duplicate the concern. This may require the use of weights, floor jacks, jackstands, frame machines, etc. In these cases you are attempting to duplicate the concern by manipulating the suspension or frame. This method is useful in finding harnesses that are too short and their connectors pull apart enough to cause a poor connection. A DMM set to the Min/Max mode and connected to the suspect circuit while testing can yield desirable results. Refer to *Testing for Electrical Intermittents on page 11-880*.

Certainly, using the senses of sight, smell, and hearing while manipulating the circuit can provide good results as well.

There may be instances where circuit manipulation alone will not meet the required criteria for the fault condition to appear. In such cases it may be necessary to expose the suspect circuit to other conditions while manipulating the harness. Such conditions would include high moisture conditions, along with exceptionally high or low temperatures. The following discusses how to expose the circuit to these kinds of conditions.

High Temperature Conditions

If the complaint tends to be heat related, you can simulate the condition using the *EL-25070* heat gun.

Using the heat gun, you can heat up the suspected area or component. Manipulate the harnesses under high temperature conditions while monitoring the scan tool or DMM to locate the fault condition.

The high temperature condition may be achieved simply by test driving the vehicle at normal operating temperature. If a heat gun is unavailable, consider this option to enhance your diagnosis. This option does not allow for the same control, however.

Low Temperature Conditions

Depending on the nature of the fault condition, placing a fan in front of the vehicle while the vehicle is in the shade can have the desired effect.

If this is unsuccessful, use local cooling treatments such as ice or a venturi type nozzle (one that provides hot or cold air). This type of tool is capable of producing air stream temperatures down to −18°C (0°F) from one end and +71°C (160°F) from the other. This is ideally suited for localized cooling needs. In addition, circuit cooling spray can be used to cool down a component or circuit.

Once the vehicle, component, or harness has been sufficiently cooled, manipulate the harness or components in an effort to duplicate the concern.

Duplicating Failure Conditions

- If none of the previous tests are successful, attempt to duplicate and/or capture the failure conditions.
- Freeze Frame/Failure Records data, where applicable, contains the conditions that were present when the DTC set.
  1. Review and record Freeze Frame/Failure Records data.
  2. Clear the DTCs using the scan tool.
  3. Switch the vehicle power mode to Vehicle Off and wait 15 seconds.
  4. Operate the vehicle under the same conditions that were noted in Freeze Frame/ Failure Records data, as closely as possible. The vehicle must also be operating within the Conditions for Running the DTC. Refer to Conditions for Running the DTC in the supporting text if a DTC is being diagnosed.
  5. Monitor DTC Status for the DTC being tested. The scan tool will indicate Ran, when the enabling conditions have been satisfied long enough for the DTC to run. The scan tool will also indicate whether the DTC passed or failed.
- An alternate method is to drive the vehicle with the DMM connected to a suspected circuit. An abnormal reading on the DMM when the concern occurs, may help you locate the concern.

Testing for Electrical Intermittents

Special Tools

EL-39200 Digital Multimeter (DMM)

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Danger: This procedure should not be performed on high voltage circuits. Performing this procedure on high voltage circuits may result in serious injury or death.

Perform the following procedures while wiggling the harness from side to side. Continue this at convenient points (about 6 inches apart) while watching the test equipment.

- *Testing for Short to Ground on page 11-877*
- *Testing for Continuity on page 11-876*
- *Testing for a Short to Voltage on page 11-877*

If the fault is not identified, perform the procedure below using the MIN MAX feature on the *EL-39200* DMM. This feature allows you to manipulate the circuit without having to watch the DMM . The DMM will generate an audible tone when a change is detected.

Note: The DMM must be used in order to perform the following procedure since the DMM can monitor current, resistance or voltage while recording the minimum (MIN), and maximum (MAX) values measured.

1. Connect the DMM to both sides of a suspected connector (still connected), or from one end of a suspected circuit to the other. Refer to *Troubleshooting with a Digital Multimeter on page 11-873* for information on connecting the DMM to the circuit.
2. Set the rotary dial of the DMM to the V (AC) or V (DC) position.
3. Press the range button of the DMM in order to select the desired voltage range.

   Note: The 100 ms RECORD mode is the length of time an input must stay at a new value in order to record the full change.
4. Select the MIN MAX function of the DMM. The DMM displays the 100 ms RECORD and emits an audible tone (beep).
5. Simulate the condition that is potentially causing the intermittent connection, either by wiggling the connections or the wiring, test driving, or performing other operations. Refer to *Inducing Intermittent Fault Conditions on page 11-879*.
6. Listen for the audible Min Max Alert which indicates that a new minimum or maximum value has been recorded.
7. Press the MIN MAX button until the MAX value is displayed and note the value.
8. Press the MIN MAX button until the MIN value is displayed and note the value.
9. Determine the difference between the MIN and MAX values.
   - If the variation between the recorded MIN and MAX voltage values is 1 V or greater an intermittent open or high resistance condition exists. Repair the condition as necessary.
   - If the variation between the recorded MIN and MAX voltage values is less than 1 V an intermittent open or high resistance condition does not exist.

Scan Tool Snapshot Procedure

Reviewing Stored Data in Global Diagnostic System (GDS)

Overview

A snapshot is a recording of what a control module on the vehicle was receiving for information while the snapshot is being made. A snapshot is used to analyze the data during the time a vehicle condition is current. In GDS 2 there is not a traditional snapshot as there has been in the past. GDS 2 saves all past VIN and diagnostic data for future viewing. GDS 2 automatically records data whenever the user views Module Diagnostics, Vehicle Diagnostics and/or Systems Diagnostics. Module Diagnostics includes DTC Data, Identification Information, Data Display, Control Functions and Configuration/Reset Functions. Vehicle Diagnostics includes Vehicle Wide DTCs. Systems Diagnostics includes Inspection/Maintenance Status and Inspection/Maintenance Information.

Reviewing Stored Data

The Review Stored Data function allows viewing and playing of previously recorded vehicle data. This information can be used in analysis of vehicle problems and detection of trigger error conditions. The graph function can be used to compare multiple parameters to see if a component is functioning properly. Recorded sessions can be selected for viewing by the following two methods:

- From the Home Page, click on Review Stored Data. In the Review Stored Data page, highlight a vehicle in the Sessions screen located in the upper pane and highlight the desired Stored Data in the lower pane, then click the Review button.
- The user can view stored data without ending a current on-vehicle diagnostic session by clicking the Vehicle Menu button (when active) or Back button until the Session Manager is displayed in the menu. This is used when a user is viewing live data and wants the quickest way to review the data. Click on the Session Manager button. Highlight the desired Stored Data in the lower pane and click the Review button.

Stored Data Review Selections

The following information can be selected in the tabs at the top of the screen:

- Graphical Data Display – Allows a detailed review of parameter data. The buttons on the right side modify the graph data
- Diagnostic Data Display – Displays incoming information from the file. The current value of the parameters is displayed on the screen.
- Line Graph – Allows selected locked parameters to be graphed with parameters overlaid for data comparison. The current value of the parameters is displayed on the screen. Use the buttons on the right side to modify the graph data.
- Bookmarks – If bookmarks are present, this displays the Type, Description and Time of automatic and manually generated bookmarks.

- System Information – Displays the GDS 2 Software Version and MDI Serial Number used when the session was recorded.
- Selected Vehicle Configuration – Displays vehicle identifiers, such as transmission type, for the vehicle selected on the Stored Data Review screen in the Sessions field.
- RPO – Displays vehicle build information.

Graphical Data Display

On the Graphical Data Display tab there are multiple selections at the top of the page. The selections available are:

- Create Report – Opens and internet browser page where a data display report can be printed or saved for future reference.
- Unit Switch – Toggles graph units between English and metric.
- Lock – When a parameter is selected, clicking the lock button locks a selected parameter for viewing in the Line Graph tab. In the Line Graph tab, locked parameters are isolated and overlaid for data comparison.
- Up Arrow – Click the up arrow to move a highlighted parameter up a position on the list.
- Down Arrow – Click the down arrow to move a highlighted parameter down a position on the list.
- Save As – This selection is available in the Graphical Data Display and Diagnostic Data Display tabs. This allows the user to export the graph data to a worksheet for in depth analysis and to timestamp data.

Review Stored Data Functions

To review the session there are buttons at the bottom of the window to control the cursor. From left to right the buttons are:

- Insert Bookmark – This button allows the user to insert bookmarks anywhere along the timeline. This provision allows the user to record notes regarding the inserted bookmark.
- Return Bookmark – This button moves the cursor to the previous bookmark.
- Back – This button moves the cursor back 1 frame.
- Timeline Slider Control – This allows the user to slide and select any position on the Timeline required.
- Forward – This button moves the cursor forward 1 frame.
- Forward Bookmark – This button moves the cursor forward 1 bookmark.
- Bookmarks - Allows the user to toggle bookmark visibility ON and OFF.

Graphical Preference Selections

The vertical side bar on the right side of the screen in the Graphical Data Display and Line Graph tabs toggles the Graphical Selection Panel from hidden to visible. The graphical preference selections available are:

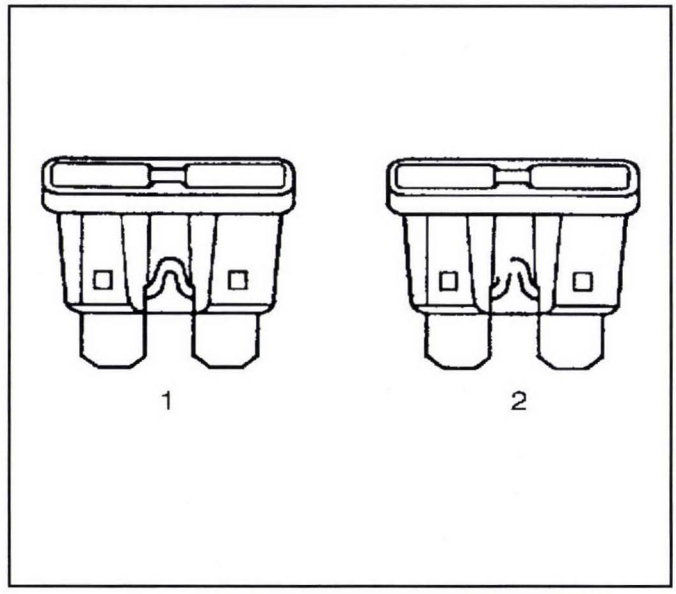
- Reset – Resets the graph display back to the initial standard GDS 2 setting.
- Grid Line Toggle – This toggle reverses the current state of showing or removing grid lines.
- Hash Mark Toggle – This toggle reverses the current state of showing or removing data acquisition points or hash marks.
- Horizontal Graph Compression – Compresses the scale of the graph horizontally.
- Horizontal Graph Expansion – Expands the scale of the graph horizontally.
- Vertical Graph Compression – Compresses the scale of the graph vertically.
- Vertical Graph Expansion – Expands the scale of the graph vertically.
- Move Centerline of Graph Up – Moves the centerline of the graph up incrementally.
- Move Centerline of Graph Down – Moves the centerline of the graph down incrementally.

Circuit Protection - Fuses

Special Tools

EL–39200 Digital Multimeter (DMM)

For equivalent regional tools, refer to *Special Tools on page 11-963*.



8786

The fuse is the most common method of an automotive wiring circuit protection. Whenever there is an excessive amount of current flowing through a circuit the fusible element will melt and create an open or incomplete circuit. Fuses are a one time protection device and must be replaced each time the circuit is overloaded. To determine if a fuse is open, remove the suspected fuse and examine if the element in the fuse

is broken (2). If not broken (1), also check for continuity using a Digital Multimeter (DMM) or a continuity tester. If the element is broken or continuity is suspect, replace the fuse with one of equal current rating.

Fuse Types

Current Rating Amperes	Color
Auto Fuses, Mini Fuses	
2	Gray
3	Violet
5	Tan
7.5	Brown
10	Red
15	Blue
20	Yellow
25	White or Natural
30	Green
Maxi Fuses	
20	Yellow
30	Light Green
40	Orange or Amber
60	Blue
50	Red
J-Case Fuses	
20	Blue
30	Pink
40	Green
50	Red
60	Yellow
Midi Fuses	
80	Black
Mega Fuses	
100	Black
150	Black
200	Black

Circuit Protection - Circuit Breakers

A circuit breaker is a protective device that is designed to open the circuit when a current load is in excess of the rated breaker capacity. If there is a short or other type of overload condition in the circuit, the excessive current will open the circuit between the circuit breaker terminals. Two types of circuit breakers are used.

Circuit Breaker: This type opens when excessive current passes through it for a period of time. It closes again after a few seconds, and if the cause of the high current is still present, it will open again. The circuit breaker will continue to cycle open and closed until the condition causing the high current is removed.

Positive Temperature Coefficient (PTC) Circuit Breaker: This type greatly increases its resistance when excessive current passes through it. The excessive current heats the PTC device, as the device heats its resistance increases. Eventually the resistance gets so high that the circuit is effectively open. Unlike the ordinary circuit breaker the PTC unit will not reset until the circuit is opened, by removing the voltage from its terminals. Once the voltage is removed the circuit breaker will re-close within a second or 2.

Circuit Protection - Fusible Links

Special Tools

EL–39200 Digital Multimeter (DMM)

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Note: When repairing a fusible link, fusible links cut longer than 225 mm (approximately 9 in) will not provide sufficient overload protection.

Fusible link is wire designed to melt and break continuity when excessive current is applied. It is often located between or near the battery and starter or electrical center. Use a continuity tester or a Digital Multimeter (DMM) at each end of the wire containing the fusible link in order to determine if it is broken. If broken, it must be replaced with fusible link of the same gauge size.

Wiring Repairs

The Wiring Repairs section contains the following types of wiring repair information. Using these elements together will make wiring repair faster and easier:

- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Flat Wire Repairs on page 11-887*
- *GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs on page 11-952*
- *High Temperature Wiring Repairs on page 11-889*
- *Heated Oxygen Sensor Wiring Repairs on page 11-890*
- *Splicing Copper Wire Using Splice Sleeves on page 11-890*
- *Splicing Twisted or Shielded Cable on page 11-893*
- *Splicing Inline Harness Diodes on page 11-894*
- *SIR/SRS Wiring Repairs on page 11-894*

Repairing Damaged Wire Insulation

Danger: In order to reduce the risk of personal injury, loss of high voltage isolation to ground and higher system impedance, do not attempt to repair any HV wiring, connector, or terminal that is damaged. High voltage coaxial type cables are not repairable. Never attempt to repair a coaxial type cable. The entire cable/harness or component must be replaced. In order to maintain system integrity and personal safety, never attempt to repair any high voltage wiring, cables, or terminals. Performing this procedure on high voltage circuits may result in serious injury or death.

If the wire insulation has been chafed, or broken, enough to show the conductive portion of the wire, and the wire is not damaged, determine the length of insulation that needs to be repaired. If the repair is less than 280 mm (11 in), cut the wire within the damaged

area. Then slide the appropriate heat shrink tubing (listed below) over the wire, and repair the wire by splicing the wires together. Refer to *Splicing Copper Wire Using Splice Sleeves on page 11-890*. Once the wire is spliced together slide heat shrink tubing over the damaged area and apply heat to seal the repaired wire.

If the wire is damaged, or the damaged area is larger than 280 mm (11 in), then replace the damaged wire by splicing in a new section of wire. Refer to *Splicing Copper Wire Using Splice Sleeves on page 11-890*.

GM Part Number	Diameter		Description	Color	Length	
	Metric	English			Metric	English
12355003	9.5 mm²	0.375 in	Tubing, Shrink 3/8	Black	305 mm²	12 in
12355005	12.7 mm²	0.5 in	Tubing, Shrink 1/2	Black	305 mm²	12 in
12355011	19.1 mm²	0.75 in	Tubing, Shrink 3/4	Black	305 mm²	12 in
12355008	25.4 mm²	1.0 in	Tubing, Shrink 1.00	Black	305 mm²	12 in

Wire Size Conversion

Metric Wire Sizes (mm²)	AWG Sizes
0.13	26
0.20	24
0.32	22
0.52	20
0.82	18
1.31	16
2.09	14
3.30	12
5.27	10
8.35	8
13.3	6

Coaxial Cable Repairs

The GM global coaxial cable repair strategy uses coaxial cables, connectors and jumpers to repair coaxial cables. The intent is to install the new service cable in vehicle, but removal of the old cable is not necessary. There are several repair scenarios:

- New cables, jumpers, and connector housing are required.
- Only new cables are required while it is possible to reuse the existing connector housing in vehicle. A jumper may or may not be needed.
- Only new connector housing are required, while it is possible to reuse the existing cable in the vehicle.
- A new cable would need to be installed from source to destination and by-pass the inline connector in some cases when an inline connector is unrepairable (Example: a cracked male end of a 1-way connector).

Coaxial Cable Kits

Four different kits will be available to repair coaxial cables. Components of each kit cannot be ordered separately from the kit.

- **Communication Interface Module Antenna Cable Kit** (Kit # 13581174) is used to repair Cellular coaxial cables. This kit uses RG58 low loss coaxial cables that are available in four lengths. The coaxial cables can be attached together in various lengths to closely match the length of the faulty/damaged coaxial cable.
- **Digital Radio and Vehicle Locator Antenna Coaxial Cable Kit** (Kit # 13581173) is used to repair XM and GPS coaxial cables. For vehicles that have a combined GPS and Cellular/OnStar signal on one cable, use Kit # 13581174. This kit uses RG316 low loss coaxial cables that are available in three lengths. The coaxial cables can be attached together in various lengths to closely match the length of the faulty/damaged coaxial cable.
- **Digital Radio, Mobile Telephone and Vehicle Locator Antenna Coaxial Cable Kit** (Kit # 19119056) is used with OnStar, XM, and GPS cables. This kit consists of jumpers and connectors. The jumpers are used to adapt different types of connectors together (to attach 2-way and 3-way connector onto the long 7, 5, and 3 foot cables). The connectors are used to replace existing connectors. The 1-way and 2-way connectors in the kit are in water-blue color (different than what the vehicle is built with) and are non-keyed (universal fit). The 3-way connectors in the kit are in the same color as in the vehicle.
- **Communication Interface Module Antenna Cable Kit** (Kit # 22803854) is used for the OnStar module on some vehicles built before the 2011 model year.

Coaxial Cable Repair Kits

Repair Kit Name		Description
Communication Interface Module Antenna Cable Kit (Kit # 13581174)		RG58 coaxial cable with female/female connectors – 7ft/2.1m
		RG58 coaxial cable with female/male connectors – 5ft/1.5m
		RG58 coaxial cable with female/male connectors – 3.5ft/1.1m
		RG58 coaxial cable with female/male connectors – 3.5ft/1.1m
Digital Radio and Vehicle Locator Antenna Coaxial Cable Kit (Kit # 13581173)		RG316 coaxial cable with female/female connectors – 7ft/2.1m
		RG316 coaxial cable with female/male connectors – 5ft/1.5m
		RG316 coaxial cable with female/male connectors – 3.5ft/1.1m
Digital Radio, Mobile Telephone and Vehicle Locator Antenna Coaxial Cable Kit (Kit # 19119056)	3-way Gen 1 sub-kit	1-way to 3-way Gen 1 jumper for female connector – Part # 13581154 – 4in/10cm 1-way to 3-way Gen 1 jumper for male connector – Part # 19119052 – 4in/10cm
		White female connector
		White male connector
		Blue female connector
		Blue male connector
	3-way Gen 2 sub-kit	1-way to 3-way Gen 2 jumper for female connector – Part # 13581155 – 4in/10cm 1-way to 3-way Gen 2 jumper for male connector – Part # 19119058 – 4in/10cm
		Tan female connector
		Tan male connector
		Gray female connector
		Gray male connector
	2-way Gen 1 sub-kit	1-way to 2-way Gen 1 jumper for female connector – Part # 13581156 – 4in/10cm
		Water-blue female connector
	2-way Gen 2 sub-kit (wide)	1-way to 2-way Gen 2 jumper for female connector – Part # 13581157 – 4in/10cm
		1-way to 2-way Gen 2 jumper for male connector – Part # 13581158 – 4in/10cm
		Water-blue female connector
		Water-blue male connector
	2-way Gen 2 and 3 sub-kit (narrow)	1-way to 2-way Gen 2 and 3 jumper for female connector – Part # 13582468 – 4in/10cm
		Use the 1-way to 2-way Gen 2 jumper for female connector 19119058 – 4in/10cm from the 2-way Gen 2 sub-kit.
		Water-blue female connector
		Water-blue male connector
	Right-angle jumper with water-blue universal 1-way connector – 4in/10cm	
Communication Interface Module Antenna Cable Kit (Kit # 22803854)		1-way to mini UHF jumper – 4in/10cm

Connector Housing Repair Procedure

The connector housings (available in Digital Radio, Mobile Telephone and Vehicle Locator Antenna Coaxial Cable Kit) are available for 1-way housings, 2-way housings and 3-way housings. Determine the connector housing required:

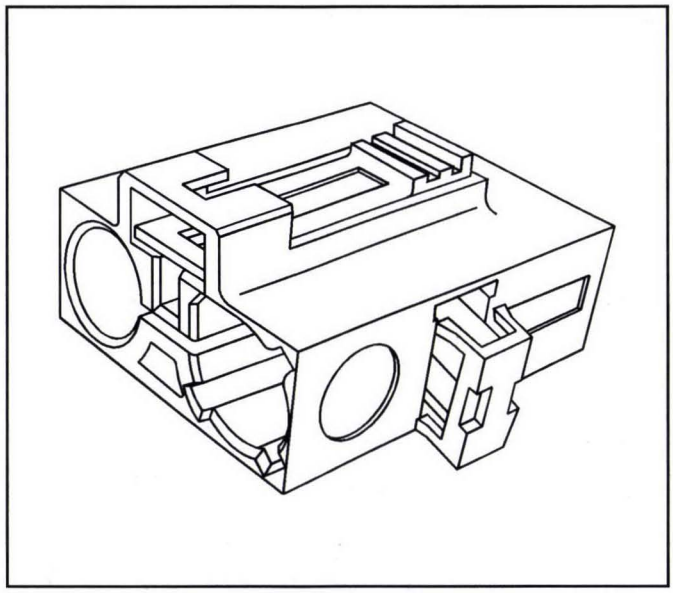
1-way housing

No change to the service coaxial cable is necessary in order to install the new coaxial cable into the vehicle.

2-way housing

A 4-inch jumper is required.

1. Determine the appropriate generation (1, 2, or 3) and/or size (12.7mm or 8mm) of the 2-way housing that is in the vehicle.
2. Remove the faulty/damaged coaxial cable from the 2-way connector housing by removing the terminal position assurance (TPA) from the connector housing and then slide the cable out of the connector.



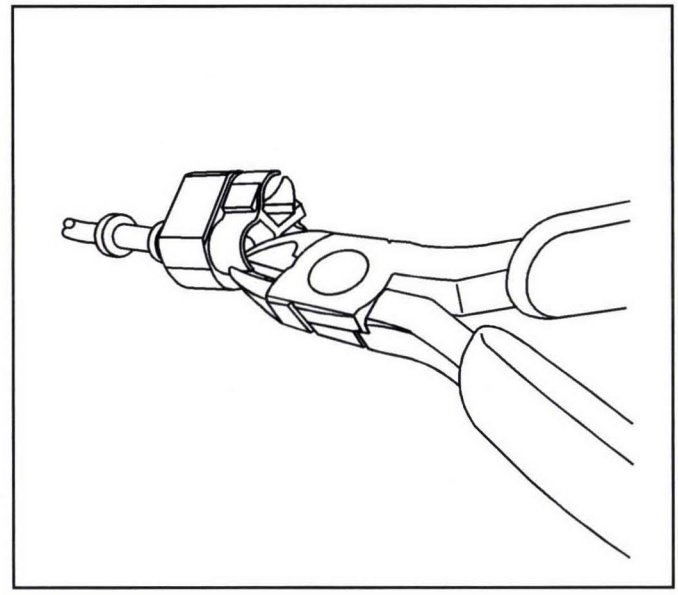
2695718

3. Install the new service coaxial cable into the vehicle. Use the 4-inch jumper for the appropriate 2-way connector housing to connect the new service coaxial cable to the connector housing.
4. If the issue is found to be the connector housing and not cable, a new connector housing may be installed while reusing all other components.

3-way housing

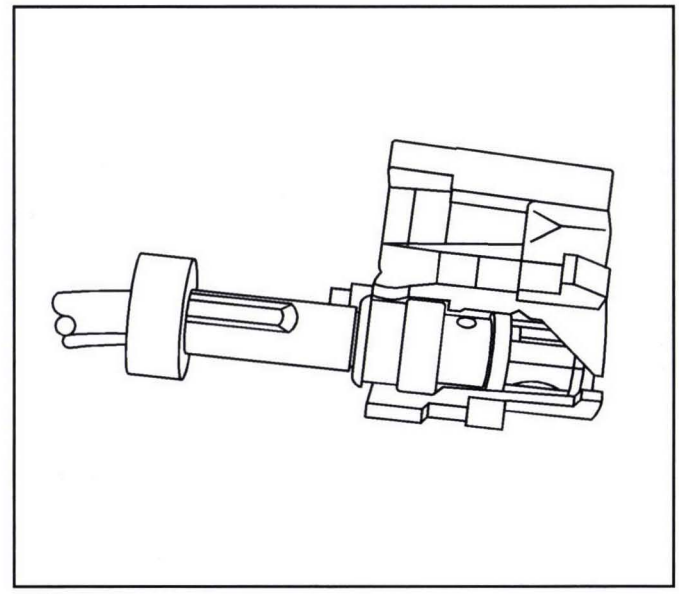
A 4-inch jumper is required.

1. Determine the appropriate generation (1 or 2) and keyed 3-way connector housing based on the connector housing color.
2. Note the locations of each of the cables in 3-way housing, as it is important for new cables be placed in the appropriate terminal location in the new connector. The connector housing colors are not interchangeable.
3. Remove the faulty/damaged coaxial cable from the 3-way connector housing by using a pair of side/diagonal cutters to nip and break away the housing.



2695719

4. Use caution not to damage the conductive ends of the coaxial cables inside the connector housing. Do not bend or force the terminal out or it could be damaged.

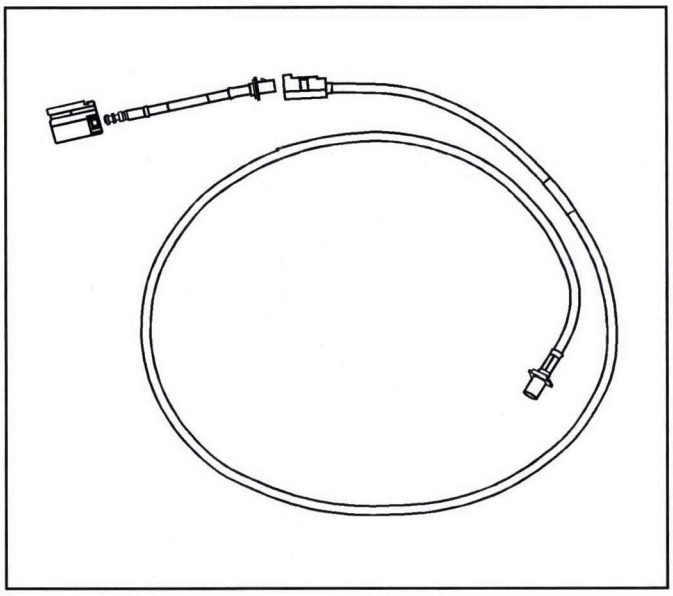


2695720

5. Install the new service coaxial cable into the vehicle. Use the 4-inch jumper for the appropriate color 3-way connector housing to connect the new service coaxial cable to the new 3-way connector housing.
6. If the issue is found to be the connector housing and not cable, a new connector housing may be installed while reusing all other components.

Coaxial Cable Repair Procedure

1. Identify the faulty/damaged coaxial cable.
2. Disconnect the faulty/damaged coaxial cable and leave it in the vehicle.
3. Identify the type of coaxial cable to be replaced and match up with the appropriate pieces to repair the damaged coaxial cable. Match up the type of coaxial cable, cable length and connector types. In some cases there may be extra length of cable left over.



2695722

4. Install the new coaxial cable in the vehicle.

   Note: Avoid routing the new coaxial cable near sharp edges that can damage the new coaxial cable.

   Use tie-straps to attach the new service coaxial cable to existing harnesses or brackets. Use felt tape/foam to reduce rattles, as necessary.

   Note: To avoid permanent damage, do not pinch the cable or bend it tighter than a 2 inch (5 centimeter) radius.
5. Remove the faulty/damaged connectors, if applicable.
6. Install new connectors or jumpers, as needed. Refer to Connector Housing Repair Procedure.
7. Verify the repair by operating the system with the vehicle in Service Mode.

Flat Wire Repairs

The flat wire within the flex wiring harness is not serviceable. If an open or short exists within the flex wiring harness the complete harness must be replaced.

Folded-Over Wire Repair

Special Tools

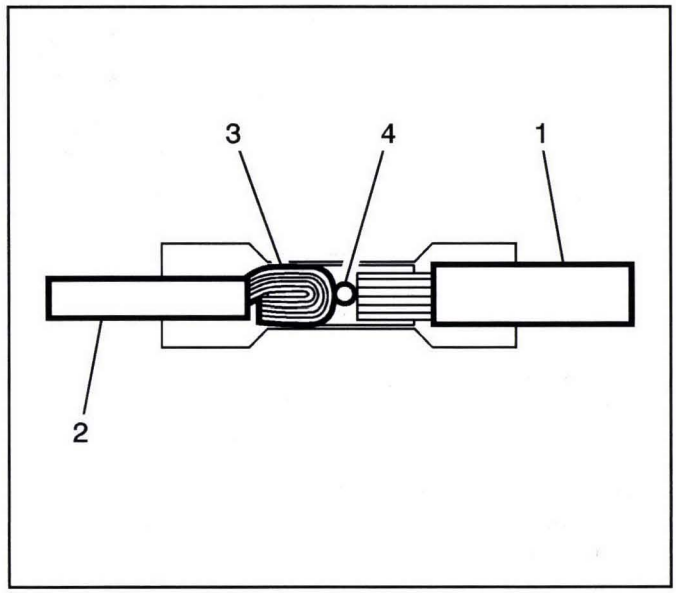
EL-38125-10 Splice Sleeve Crimping Tool

For equivalent regional tools, refer to *Special Tools on page 11-963.*

The GM global wire repair strategy uses connector assemblies (pigtails) and terminated leads to repair wiring harnesses.

To reduce and manage GM Service Parts proliferation, the service pigtails and terminated leads are designed with the largest wire gauge size that can be held by either the terminal or the connector housing.

The folded over wire repair technique, in which the copper wire strands are folded over before being installed into a splice sleeve, allows the service part to be used when repairing a smaller gauge size wire in a vehicle. This technique has passed all GM testing standards.



2527260

The larger harness size wires (1) will be placed in one side of the splice sleeve and match the splice sleeve closely in size. The wires are moved into the splice sleeve until they hit the stop (4) in the splice sleeve. The smaller harness size wires (2) will be placed in the other side of the splice sleeve. The smaller harness size wires will be folded over (3) to match up with the splice sleeve size.

Use the folded over wire repair for:

Note: Increasing the amount of copper strands in the smaller gauge size will allow for a better crimp

- Splicing wires of 0.35 mm or less (22, 24, 26 gauge sizes)

  Note: Vehicle side needs to be of same or less gauge size (not greater than the service part's gauge size)
- Splicing wires of different gauges

Use the Service Information (SI) connector end-views to determine:

- Gauge size of wiring harness
- Recommended Repair: Terminated Lead or Pigtail

The following table lists the acceptable variance within the gauge size

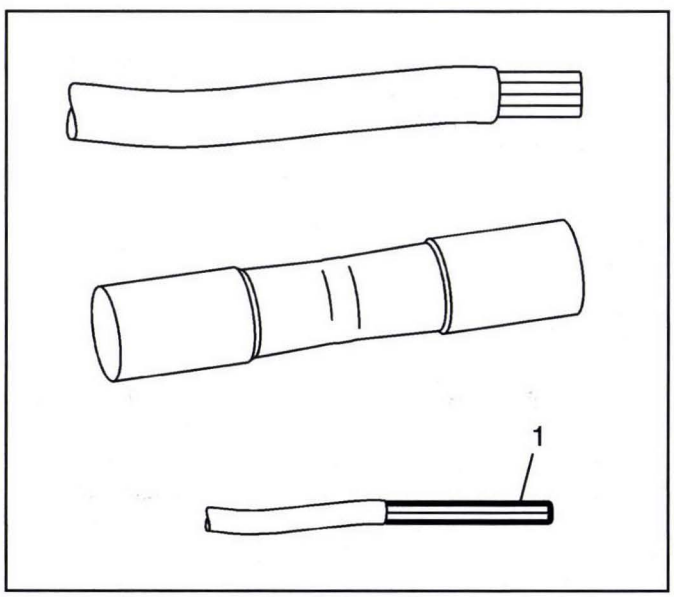
Folded-Over Wire Selection Table

Harness Wire Gauge		Connector Assembly (Pigtail) or Terminated Lead Wire Gauge Size			
—		Salmon Color Splice Sleeve		Blue Color Splice Sleeve	Yellow Color Splice Sleeve
Metric	—	0.35 mm	0.5–0.8 mm	1.0–2.0 mm	3.0–5.0 mm
—	Wire Gauge (AWG)	22	20–18	16–14	12–10
0.13 mm	26	Fold Over Wire	Fold Over Wire	Fold Over Wire	Not Acceptable
0.22 mm	24	Fold Over Wire	Fold Over Wire	Fold Over Wire	Not Acceptable
0.35 mm	22	Fold Over Wire	Fold Over Wire	Fold Over Wire	Not Acceptable
0.5 mm	20	Not Acceptable	Wire to Wire	Fold Over Wire	Not Acceptable
0.75 mm	—	Not Acceptable	Wire to Wire	Fold Over Wire	Not Acceptable
0.8 mm	18	Not Acceptable	Wire to Wire	Fold Over Wire	Not Acceptable
1.0 mm	16	Not Acceptable	Wire to Wire	Fold Over Wire	Not Acceptable
1.5 mm	—	Not Acceptable	Not Acceptable	Wire to Wire	Fold Over Wire
2.0 mm	14	Not Acceptable	Not Acceptable	Wire to Wire	Fold Over Wire
2.5 mm	—	Not Acceptable	Not Acceptable	Wire to Wire	Fold Over Wire
3.0-5.0 mm	12–10	Not Acceptable	Not Acceptable	Not Acceptable	Wire to Wire

Example

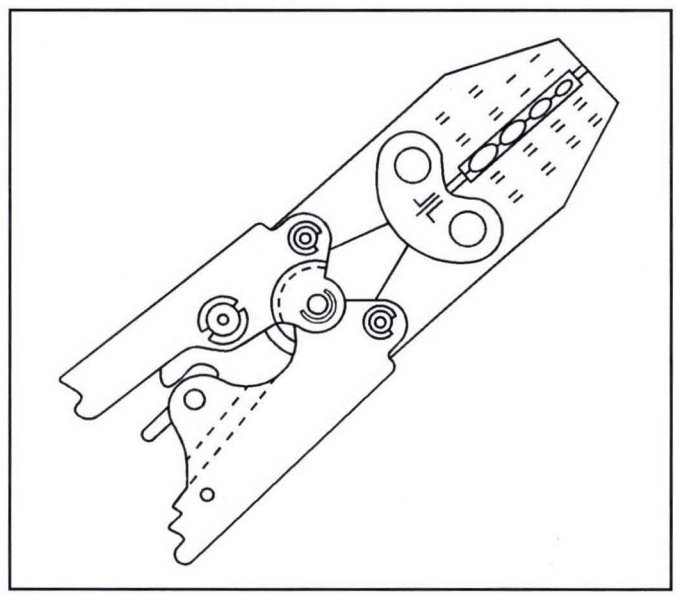
For an IP Harness of 0.22 mm (24 gauge on left side of table) wire size, the SI connector end-view recommends a pigtail with leads of 0.8 mm (18 gauge on the top of the table) with a salmon colored DuraSeal splice sleeve of 0.5–1.0 mm (20–16 gauge).

Follow these steps to use the folded over wire (1) technique on an IP Harness.



2527267

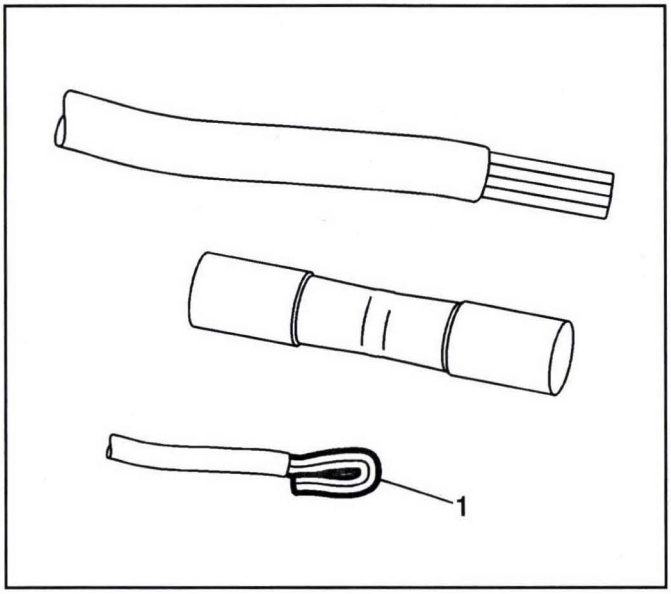
Strip twice the amount of insulation on the smaller (1) wire (IP Harness is the lower wire) than normally required. Normally, the terminated leads have 5 mm of insulation stripped off the wire.



2537879

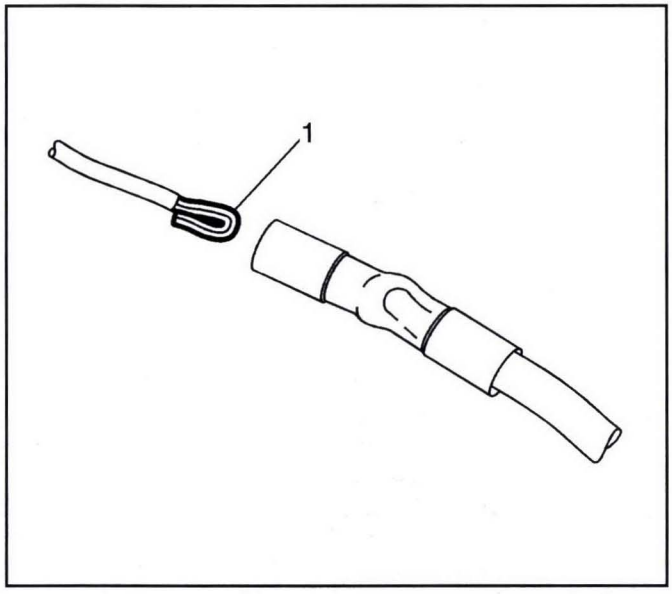
Note: Use *EL-38125-10* splice sleeve crimping tool.

1. For wiring repair, refer to *Splicing Copper Wire Using Splice Sleeves on page 11-890*.



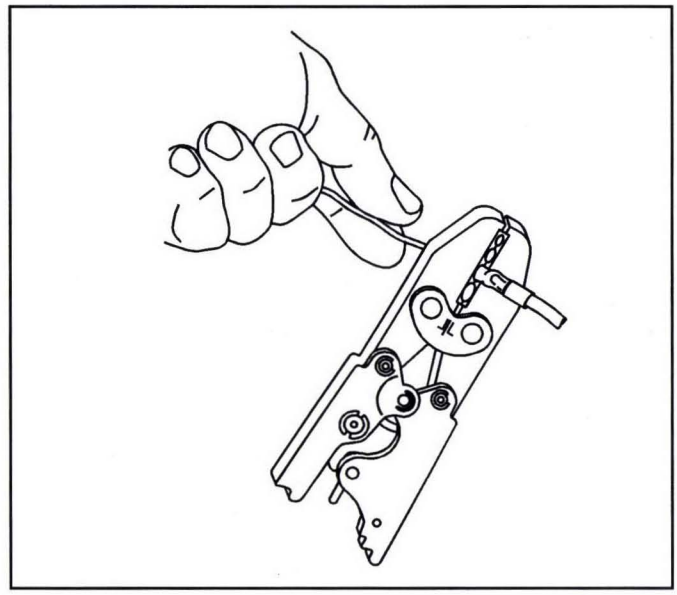
2527270

2. Twist the wires before you fold them over to prevent the wire strands from opening up. Fold over the copper wire strands of the smaller (1) gauge wire so that it is the same length as the non-folded wire.



2527272

3. Insert the folded over wire (1) into the splice sleeve.



2527273

4. Use the proper crimp tool to crimp the splice sleeve to the smaller wire (harness side of repair). Complete the crimp as usual (using the heat tool to shrink the tube).

High Temperature Wiring Repairs

Note: All wiring repairs need to be 200 mm from the heat zone. Areas of consideration would be any area located near the exhaust manifolds, catalytic converter, exhaust pipes, and turbocharged engines.

Items Required

- DuraSeal splice sleeves to crimp and seal connections
- High temperature SCT1 shrink tubing to protect the splice sleeves
- Terminated leads or pigtails
- The correct tools to remove the terminals from the connectors

Use high temperature bulk wire rated at 150°C (302°F) continuous temperature of the same or larger gauge size as the original wire when repair damage wire. Also replace any reflective tape that you remove during the repair.

High Temperature Wiring

Wiring that is exposed to high temperatures, 135°C (275°F) or higher, for prolonged periods of time may use materials i.e. wires, connectors, and shielding that has a higher heat rating than typical wiring. When making a repair in a high temperature area observe the following:

- Use high temperature bulk wire rated at 150°C (302°F) continuous temperature to replace any damaged wire.
- Replace any heat shielding that is removed.
- Cover any DuraSeal splice sleeves with SCT1 shrink tubing.
- After making a wiring repair, ensure that the location of the wiring is not moved closer to the heat source.

Identifying High Temperature Wiring

Note: High temperature areas would be areas located near exhaust manifolds, catalytic converters, exhaust pipes, and turbocharged engines.

Wiring that is exposed to high temperature, 135°C (275°F) or higher, for prolonged periods of time need special considerations when making wiring repairs. Areas that may be exposed to higher temperatures can be identified by heat resistant materials that are being used in those areas. These materials may include heat reflective tape, moon tape, and high temperature shrink tubing. Also conduit and other protective coverings may be used. Because conduit or similar coverings are used throughout the vehicle regardless of the temperature, it may be necessary for the technician to determine if an area is exposed to excessive heat before making a wiring repair.

Heated Oxygen Sensor Wiring Repairs

Caution: Do not solder repairs under any circumstances as this could result in the air reference being obstructed.

If the heated oxygen sensor pigtail wiring, connector, or terminal is damaged the entire oxygen sensor assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly it must have a clean air reference. This clean air reference is obtained by way of the oxygen sensor signal and heater wires. Any attempt to repair the wires, connectors or terminals could result in the obstruction of the air reference and degrade oxygen sensor performance.

The following guidelines should be used when servicing the heated oxygen sensor:

- Do not apply contact cleaner or other materials to the sensor or vehicle harness connectors. These materials may get into the sensor, causing poor performance. Also, the sensor pigtail and harness wires must not be damaged in such a way that the wires inside are exposed. This could provide a path for foreign materials to enter the sensor and cause performance problems.
- Neither the sensor nor vehicle lead wires should be bent sharply or kinked. Sharp bends, kinks, etc., could block the reference air path through the lead wire.
- Do not remove or defeat the oxygen sensor ground wire (where applicable). Vehicles that utilize the ground wire sensor may rely on this ground as the only ground contact to the sensor. Removal of the ground wire will also cause poor engine performance.
- To prevent damage due to water intrusion, be sure that the peripheral seal remains intact on the vehicle harness connector.

Splicing Copper Wire Using Splice Sleeves

Special Tools

- *EL-38125-10* Splice Sleeve Crimping Tool
- *EL-38125-5* Ultra Torch Special Tool
- DuraSeal splice sleeves, in order to repair the SIR/SRS wiring

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Danger: In order to reduce the risk of personal injury, loss of high voltage isolation to ground and higher system impedance, do not attempt to repair any HV wiring, connector, or terminal that is damaged. High voltage coaxial type cables are not repairable. Never attempt to repair a coaxial type cable. The entire cable/harness or component must be replaced. In order to maintain system integrity and personal safety, never attempt to repair any high voltage wiring, cables, or terminals. Performing this procedure on high voltage circuits may result in serious injury or death.

Note: If the wiring harness internal to the transmission is damaged, the wiring harness must be replaced. The use of splice sleeves in an attempt to repair the internal transmission wires, connectors, or terminals could result in performance issues.

Note: Do not splice wires in Door Harness Grommets.

Note:

- Use only DuraSeal splice sleeves. Other splice sleeves may not protect the splice from moisture or provide a good electrical connection.
- For wire Gauge smaller than .5 mm (18 gauge) refer to *Folded-Over Wire Repair on page 11-887*

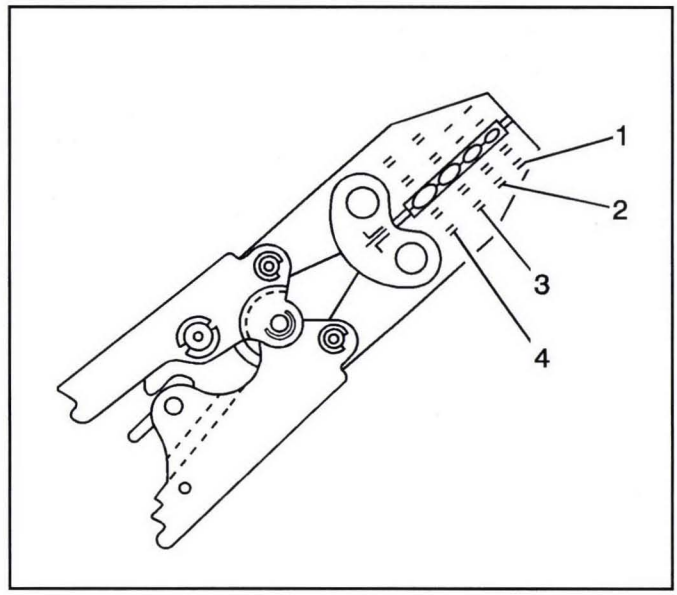
Use DuraSeal splice sleeves to form a one-to-one splice on all types of insulation except high voltage and specialty cables. Use DuraSeal splice sleeves where there are special requirements such as moisture sealing. Follow the instructions below in order to splice copper wire using DuraSeal splice sleeves.

Splice Sleeve Color	Crimp Tool Nest Color		Wire Gauge mm² / (AWG)
	3 Crimp Nests	4 Crimp Nests	
Salmon (Yellow-Pink) 19168446	Red (1) or Red/Green (1)	Red (2)	0.5–0.8/(18–20)
Blue 19168447	Blue (2)	Blue (3)	1.0–2.6/(14–16)
Yellow 19168448	Yellow (3)	Yellow (4)	3.0–5.0/(10–12)

Note: You must perform the following procedures in the listed order. Repeat the procedure if any wire strands are damaged. You must obtain a clean strip with all of the wire strands intact.

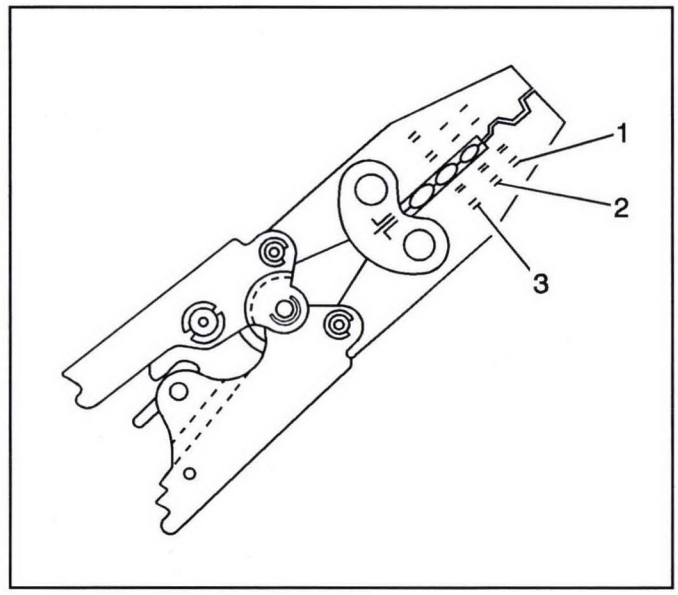
1. Open the harness by removing any tape:
   - Use a sewing seam ripper, available from sewing supply stores, in order to cut open the harness in order to avoid wire insulation damage.
   - Use the DuraSeal splice sleeves on all types of insulation except Tefzel and coaxial.
   - Do not use the crimp and DuraSeal splice sleeve to form a splice with more than 2 wires coming together.
2. Cut as little wire off the harness as possible. You may need the extra length of wire in order to change the location of a splice.

   Adjust splice locations so that each splice is at least 40 mm (1.5 in) away from the other splices, harness branches, or connectors.
3. Strip the insulation:
   - When adding a length of wire to the existing harness, use the same size wire as the original wire.
   - Perform one of the following items in order to find the correct wire size:
     – Find the wire on the schematic and convert to regional wiring gauge size.
     – If you are unsure of the wire size, begin with the largest opening in the wire stripper and work down until achieving a clean strip of the insulation.
   - Strip approximately 5.0 mm (0.20 in) of insulation from each wire to be spliced.
   - Do not nick or cut any of the strands. Inspect the stripped wire for nicks or cut strands.
   - If the wire is damaged, repeat this procedure after removing the damaged section.
4. For high temperature wiring, slide a section of high temperature SCT1 shrink tubing down the length of wire to be spliced. Ensure that the shrink tubing will not interfere with the splice procedure.
5. Select the proper DuraSeal splice sleeve according to the wire size. Refer to the above table at the beginning of the repair procedure for the color coding of the DuraSeal splice sleeves and the crimp tool nests.



2414855

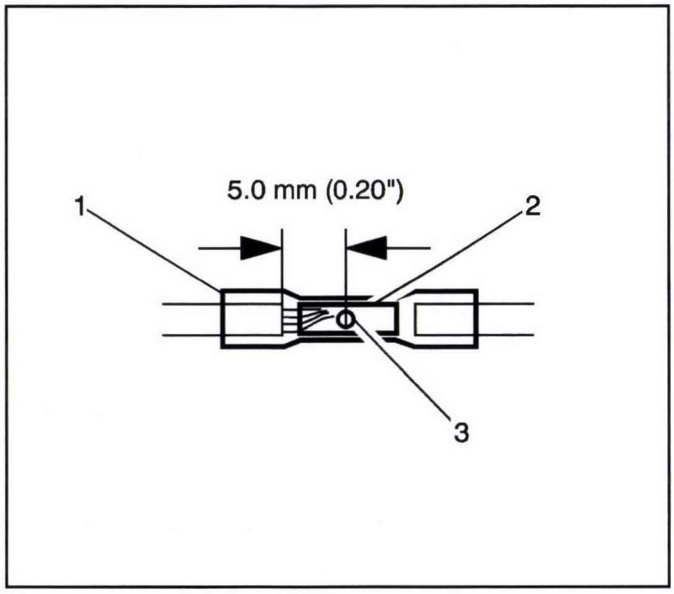
6. The *EL-38125-10* splice sleeve crimping tool has four crimp nests. The largest crimp nest (4) is used for crimping 10 and 12 gauge wires. The second largest crimp nest (3) is used for crimping 14 and 16 gauge wires. The third largest crimp nest (2) is used for crimping 18 and 20 gauge wires. The smallest crimp nest (1) is used for crimping 22 to 26 gauge wires. The crimp nests are referenced in the table (farther above) under the crimp tool nest color.



68642

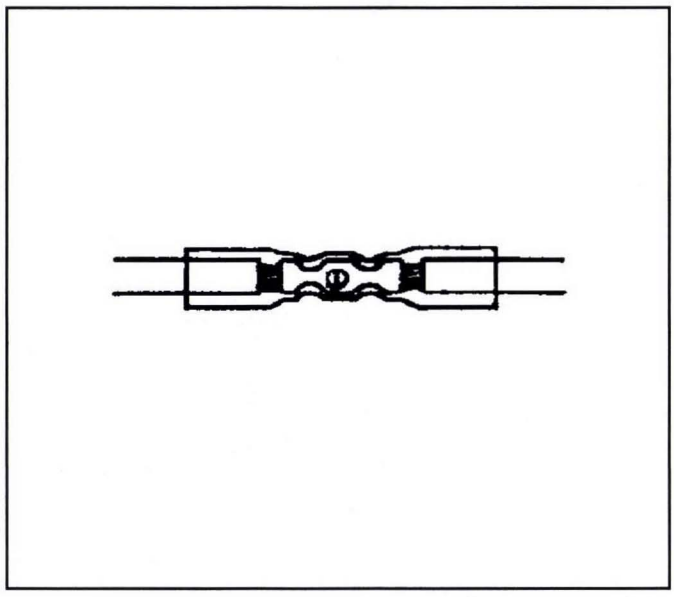
7. The *J-38125-8* splice sleeve crimping tool has three crimp nests. The largest crimp nest (3) is used for crimping 10 and 12 gauge wires. The second largest crimp nest (2) is used for crimping 14 and 16 gauge wires. The smallest crimp nest (1) is used for crimping 18 to 20 gauge wires. The crimp nests are referenced in the table (farther above) under the crimp tool nest color.

8. Use the splice sleeve crimp tool in order to position the DuraSeal splice sleeve in the proper color nest of the splice sleeve crimp tool. For the four crimp nest tool, use the three largest crimp nests to crimp the splice sleeves. For the three crimp nest tool, use all three crimp nests to crimp the splice sleeves. Use the four and three crimp tool diagrams (above) and the table (farther above) to match the splice sleeve with the correct crimp nest. The crimp tool diagram callout numbers match the numbers in the table (under crimp tool nest color).



68639

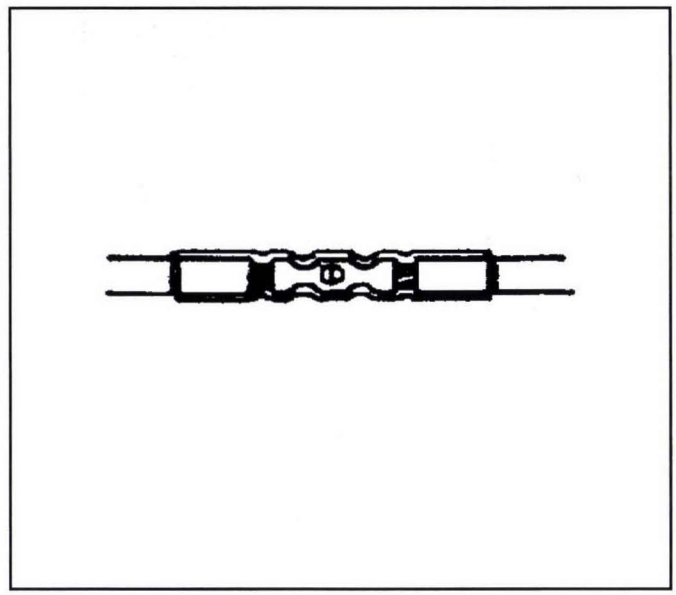
9. Place the DuraSeal splice sleeve in the nest. Ensure that the crimp falls midway between the end of the barrel and the stop. The sleeve has a stop (3) in the middle of the barrel (2) in order to prevent the wire (1) from going further. Close the hand crimper handles slightly in order to firmly hold the DuraSeal splice sleeve in the proper nest.



9502

10. Insert the wire into the splice sleeve barrel until the wire hits the barrel stop.
11. Tightly close the handles of the crimp tool until the crimper handles open when released.

    The crimper handles will not open until you apply the proper amount of pressure to the DuraSeal splice sleeve. Repeat steps 4 and 6 for the opposite end of the splice.



9503

12. Using the EL-38125–5 ultra torch, apply heat to the crimped area of the barrel.
13. Start in the middle and gradually move the heat barrel to the open ends of the tubing:
    - The tubing will shrink completely as the heat is moved along the insulation.
    - A small amount of sealant will come out of the end of the tubing when sufficient shrinkage is achieved.

High Temperature Wiring Repairs

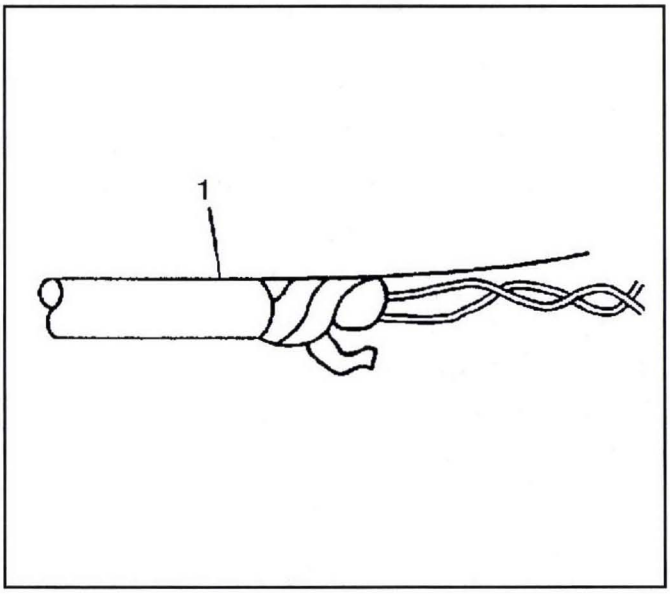
Use the following procedures to perform high temperature wiring repairs:

1. Center the high temperature SCT1 shrink tube over the DuraSeal splice sleeve.
2. Using the EL-38125–5 ultra torch, apply heat to the high temperature heat shrink tubing.
3. Gradually move the heat from the center to the open end of the tubing:
    - The tubing will shrink completely as the heat is moved along the insulation.
    - A small amount of sealant will come out of the end of the tubing when sufficient shrinkage is achieved.
4. Replace any reflective tape and clips that may have been removed during the repair.

Splicing Twisted or Shielded Cable

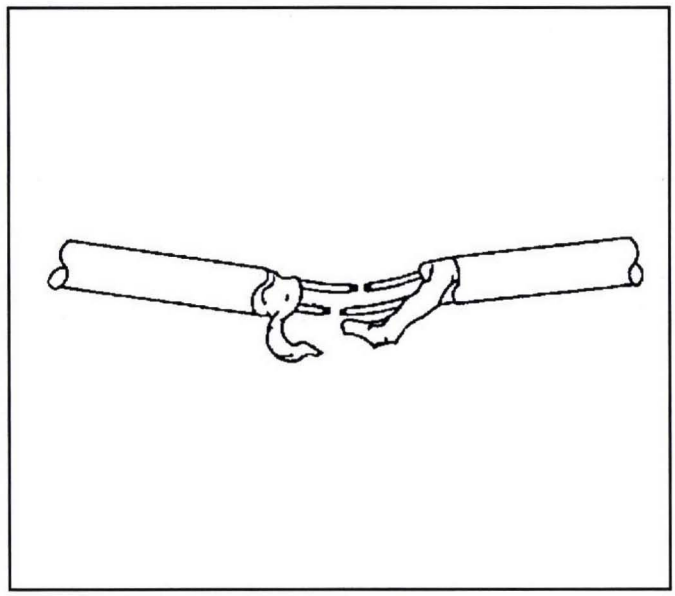
Danger: In order to reduce the risk of personal injury, loss of high voltage isolation to ground and higher system impedance, do not attempt to repair any HV wiring, connector, or terminal that is damaged. High voltage coaxial type cables are not repairable. Never attempt to repair a coaxial type cable. The entire cable/harness or component must be replaced. In order to maintain system integrity and personal safety, never attempt to repair any high voltage wiring, cables, or terminals. Performing this procedure on high voltage circuits may result in serious injury or death.

Twisted/shielded cable is used in order to protect wiring from electrical noise. Two-conductor cable of this construction is used between the radio and the Delco-Bose® speaker/amplifier units and other applications where low level, sensitive signals must be carried. Follow the instructions below in order to repair the twisted/shielded cable.



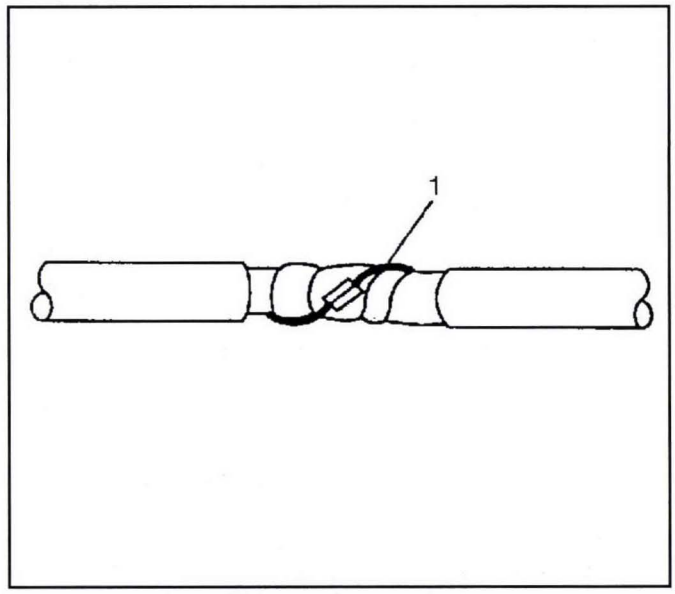
8798

1. Remove the outer jacket (1). Use care not to cut into the drain wire of the mylar tape.
2. Unwrap the tape. Do not remove the tape. Use the tape in order to rewrap the twisted conductors after the splice is made.



8799

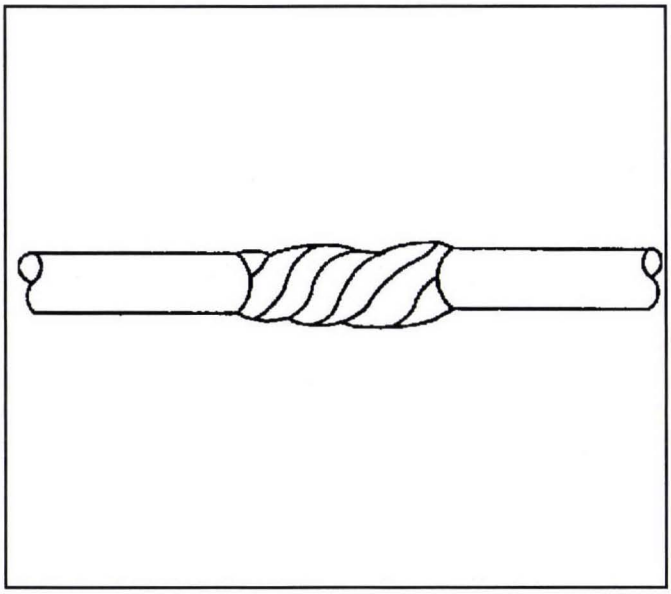
3. Prepare the splice. Untwist the conductors and follow the instructions for *Splicing Copper Wire Using Splice Sleeves on page 11-890*. Staggering the splices by 65 mm (2.5 in) is recommended.



8800

Note: Apply the mylar tape with the aluminum side inward. This ensures good electrical contact with the drain wire.

4. Re-assemble the cable.
   - Rewrap the conductors with the mylar tape. If the mylar tape is damaged, use 3M product AL-36FR to replace the damaged mylar tape.
   - Use caution not to wrap the drain wire in the tape (1).
   - Follow the splicing instructions for copper wire and splice the drain wire.
   - Wrap the drain wire around the conductors and tape with electrical tape to replace the outer insulation.



8801

5. Tape over the entire cable. Use a winding motion when you apply the tape.

Splicing Inline Harness Diodes

Many vehicle electrical systems use a diode to isolate circuits and protect the components from voltage spikes. When installing a new diode use the following procedure.

1. Open the harness.
   - If the harness is taped, remove the tape.
   - To avoid wiring insulation damage, use a sewing seam ripper (available from sewing supply stores) in order to cut open the harness.
   - If the harness has a black plastic conduit, pull out the diode.
2. If the diode is taped to the harness, remove all of the tape.
3. Check and record the current flow direction and orientation of diode.
4. Remove the inoperative diode from the harness with a suitable soldering tool.

   Note: If the diode is located next to a connector terminal remove the terminal(s) from the connector to prevent damage from the soldering tool.
5. Carefully strip away a section of insulation next to the old soldered portion of the wire(s). Do not remove any more than is needed to attach the new diode.
6. Check current flow direction of the new diode, being sure to install the diode with correct bias. Reference the appropriate service manual wiring schematic to obtain the correct diode installation position.
7. Attach the new diode to the wire(s) using 60/40 rosin core solder. Before soldering attach some heat sinks (aluminum alligator clips) across the diode wire ends to protect the diode from excessive heat. Follow the manufacturer's instruction for the soldering equipment.
8. Reinstall terminal(s) into the connector body if previously removed.

   Note: To prevent shorts to ground and water intrusion, completely cover all exposed wire and diode attachment points with tape.
9. Tape the diode to the harness or connector using electrical tape.

SIR/SRS Wiring Repairs

Note: Refer to *SIR Service Precautions on page 12-152*.

For European Regions

Caution: If the SIR/SRS wiring, connector, or terminal is damaged, the affected wiring harness must be replaced. Do not attempt to repair the wiring, connector, or terminals. Any attempt to repair the wires, connectors, or terminals could result in performance problems of the SIR/SRS System. Operations on restraint systems must only be performed by trained and qualified personnel.

Special Tools

EL-38125-10 Splice Sleeve Crimping Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

The Supplemental Inflatable Restraint (SIR) System/ Supplemental Restraint System (SRS) requires special wiring repair procedures due to the sensitive nature of the circuitry. Follow the specific procedures and instructions when working with the SIR/SRS, and the wiring components, such as connectors and terminals.

SIR/SRS Connector Repair (Plastic Body and Terminal Metal Pin)

Note: Do not use the terminals in the kit in order to replace damaged SIR/SRS system terminals. Use either an SIR/SRS pigtail or a terminated lead from the SIR Repair Kit Tray.

The terminals in the SIR/SRS system are made with a special plating. This plating provides the necessary contact integrity for the sensitive, low energy circuits.

Pigtail repair packs are available for SIR/SRS connectors with eight or less terminals. Only the connector body is available for connectors with more than eight terminals. Terminated leads can be used to replace damaged terminals when replacing the connector body.

SIR/SRS Component Wire Pigtail Repair

Note: Do not make wire, connector, or terminal repairs on components with wire pigtails.

A wire pigtail is a wire or wires attached directly to the device, not by a connector. If a wiring pigtail is damaged, you must replace the entire component, with pigtail. The inflatable restraint steering wheel module coil is an example of a pigtail component.

SIR/SRS Wire Repair

Caution: Do not install more than 2 DuraSeal splice sleeves per SIR deployment loop. A deployment loop consists of both wires from the K36 Inflatable Restraint Sensing and Diagnostic Module to the deployable

component. If more than 2 DuraSeal splice sleeves are required for any SIR deployment loop, the complete circuit of the loop must be replaced. More than 2 DuraSeal splice sleeves per deployment loop may increase the resistance in the circuit causing a DTC to be set.

Note: Refer to Wiring Repairs in the service information connector end views or the vehicle schematics in order to determine the correct wire size for the circuit you are repairing. You must obtain this information in order to ensure circuit integrity.

If any wire except the pigtail is damaged, repair the wire by splicing in a new section of wire of the same gauge size (0.5 mm, 0.8 mm, 1.0 mm etc.). Use the DuraSeal splice sleeves and *EL-38125-10* splice sleeve crimping tool. For wiring repair, refer to *Splicing Copper Wire Using Splice Sleeves on page 11-890*.

For connector position assurance (CPA), refer to *Connector Position Assurance Locks on page 11-898*.

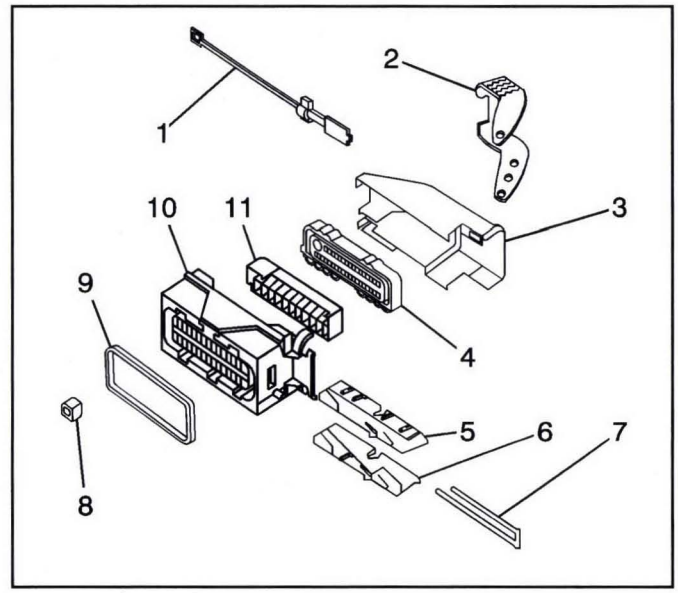
For terminal position assurance (TPA), refer to *Terminal Position Assurance Locks on page 11-898*.

Connector Repairs

Connector Repairs contains a list of all connector repairs. The connector repairs are listed by the connector manufacturer and then by connector type. If the technician cannot identify the manufacturer of the connector, refer to Identifying Connectors below. Knowing the connector manufacturer will assist in finding the correct connector repair from the following list:

- *Connector Position Assurance Locks on page 11-898*
- *Terminal Position Assurance Locks on page 11-898*
- *AFL/EPC Connectors on page 11-898*
- *Bosch Connectors (BSK) on page 11-901* or *Bosch Connectors (0.64) on page 11-901* or *Bosch Connectors (2.8 JPT) on page 11-903* or *Bosch Connectors (ECM) on page 11-903*
- *Delphi Connectors (Weather Pack) on page 11-905* or *Delphi Connectors (Pull To Seat) on page 11-907* or *Delphi Connectors (Push To Seat) on page 11-906* or *Delphi Connectors (12-Way) on page 11-913* or *Delphi Connectors (Micro .64) on page 11-910* or *Delphi Connectors (Steering Gear) on page 11-915* or *Delphi Connectors (Micro-Pack 100W) on page 11-908*
- *FCI Connectors (Lever Lock) on page 11-916* or *FCI Connectors (SIR) on page 11-917*
- *FEP Connectors (Steering Gear) on page 11-918*
- *JST Connectors on page 11-919*
- *Kostal Connectors (Glow Plug Control Module) on page 11-921* or *Kostal Connectors (Transmission) on page 11-923*
- *Molex Connectors on page 11-925* or *Molex Connectors (SIR) on page 11-927*
- *Sumitomo Connectors on page 11-928*
- *Tyco/AMP Connectors (Sensor) on page 11-932* or *Tyco/AMP Connectors (SIR) on page 11-945* or *Tyco/AMP Connectors (43-Way) on page 11-934* or *Tyco/AMP Connectors (Door Module) on page 11-935* or *Tyco/AMP Connectors (102-Way Inline) on page 11-937* or *Tyco/AMP Connectors (0.25 Cap) on page 11-932* or *Tyco/AMP Connectors (Seat) on page 11-943* or *Tyco/AMP Connectors (CM 42-Way) on page 11-930*
- *Yazaki Connectors (2-Way) on page 11-947* or *Yazaki Connectors (16-Way) on page 11-947*
- *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949*

Connector Anatomy



1709341

Legend

(1)	Connector Positive Assurance (CPA)
(2)	Assist Lever
(3)	Wiredress Cover
(4)	Seal Strain/Relief
(5)	Slide Left Hand
(6)	Slide Right Hand
(7)	Terminal Positive Assurance (TPA)
(8)	Terminal Positive Assurance (TPA)
(9)	Connector Seal
(10)	Connector Housing
(11)	Inner Connector

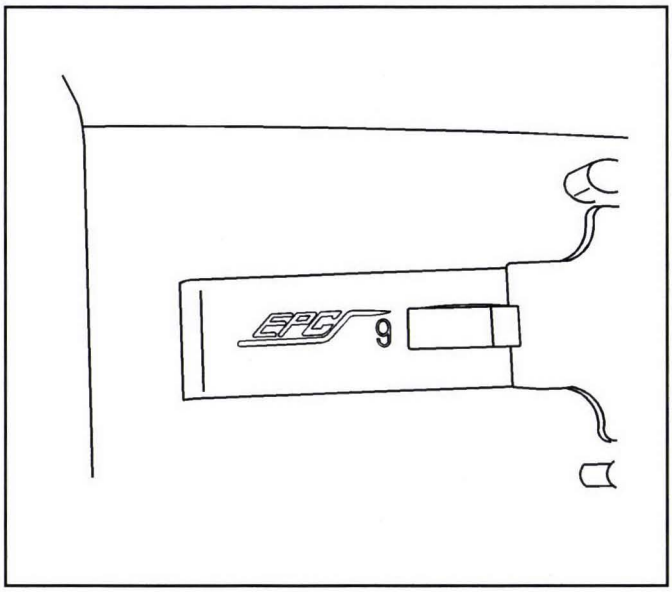
Identifying Connectors

Knowing the connector manufacturer is helpful when trying to locating the correct connector repair procedure. There are many different connector designs used on GM vehicles and it is sometimes difficult to identify the connector manufacturer. The information in this document should help with the identification of connector manufactures.

The following connector manufacturers make most of the connectors found in GM vehicles:

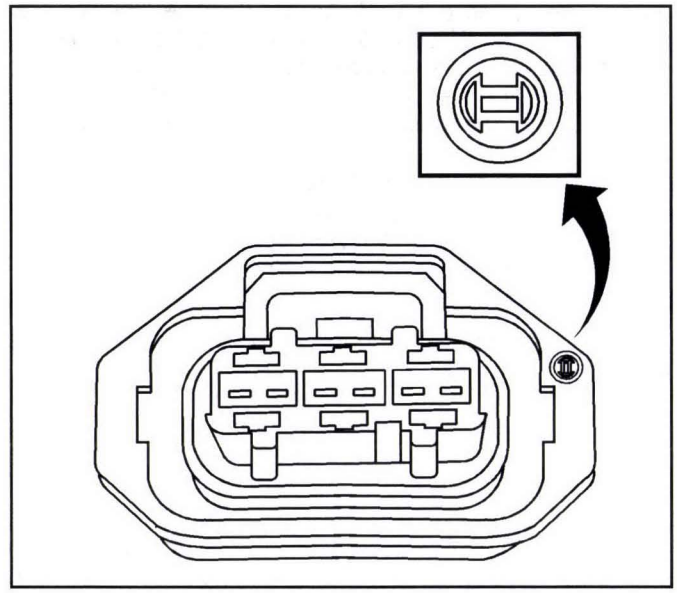
- AFL/EPC (Alcoa Fujikura Ltd./Engineered Plastics Components)
- Bosch
- Delphi
- FCI (Framatome Connectors International)
- JAE (Japan Aviation Electronics)
- JST (Japan Solderless Terminals)
- Kostal
- Molex
- Sumitomo
- Tyco/AMP
- Yazaki

Identifying the manufacturer of a connector is often difficult. When trying to determine the manufacturer of a connector, look for specific identifying marks that are unique to that connector supplier. Most of these identify marks are hard to find or see. Check the connector carefully and refer to the information below for pictures and descriptions of connector identification markings.



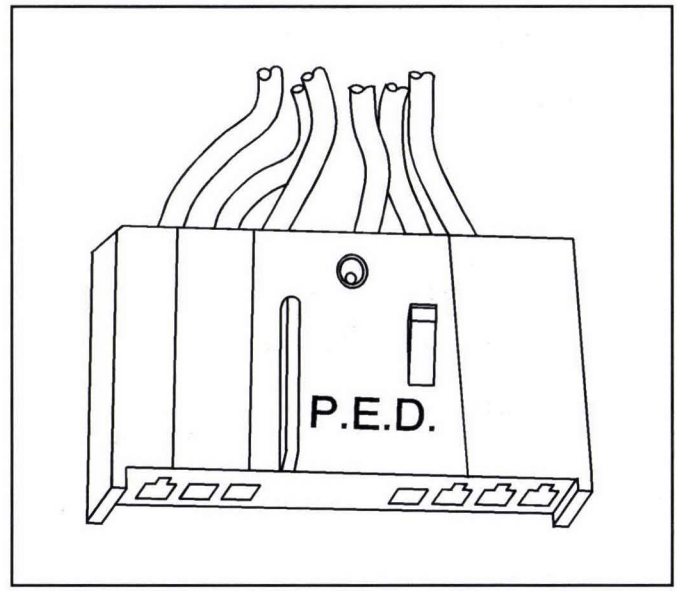
1466850

- Most of AFL's connectors have EPC on their connector body. Some of the smaller connectors will not have any markings on them.



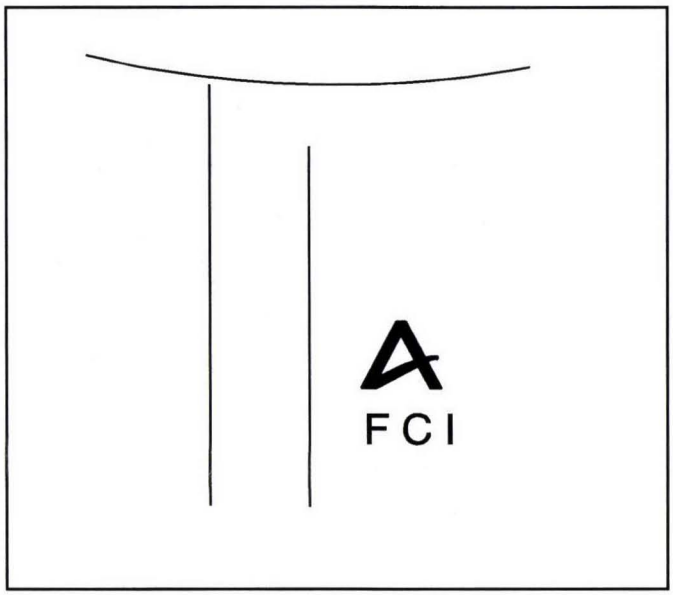
1460356

- In some cases Bosch will actually be printed on the connector. If Bosch does not appear on the connector, look for the Bosch logo. The Bosch logo is a circle with a blunted arrow inside. This logo can appear anywhere on the connector and is often very small.



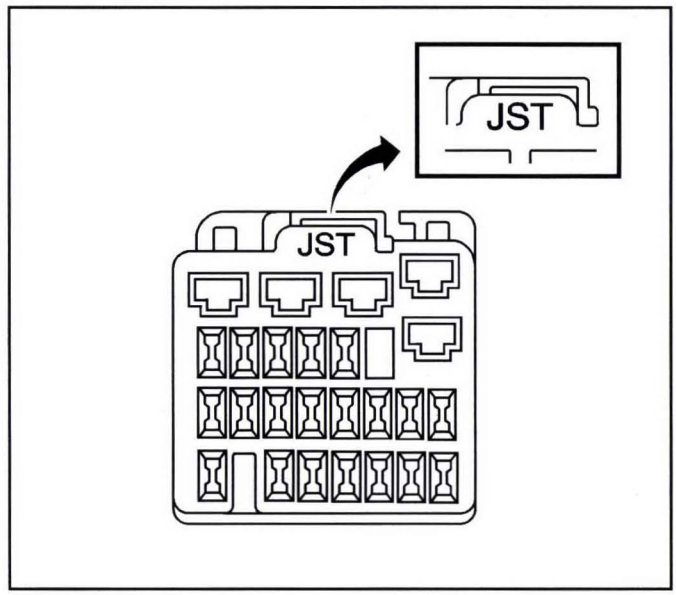
1460486

- In some cases Delphi will actually be printed on the connector. If Delphi is not printed on the connector, look for PED. In both cases there is no specific orientation for Delphi or PED and they can appear anywhere on the connector.



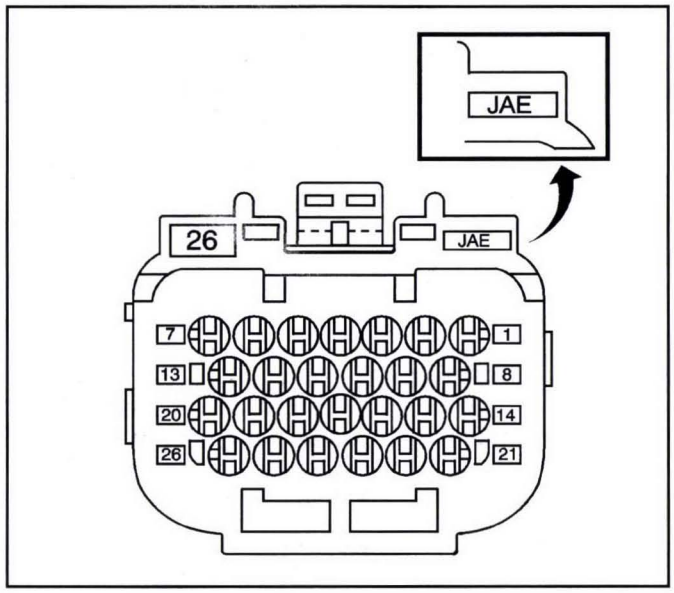
1460611

- FCI connectors may have the FCI logo on their connectors. The logo is the letters FCI with an “A” above it.



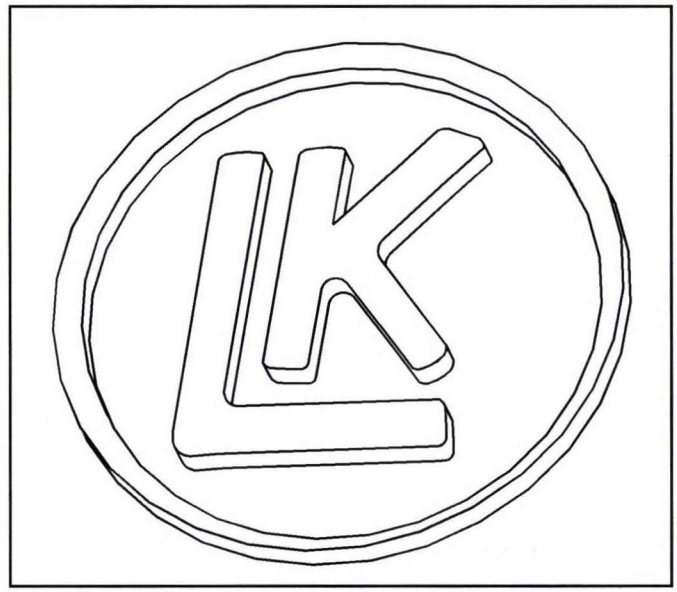
1468706

- JST connectors have JST in small letters on their connectors, similar to that above. The location of the logo will vary with the connector size and style.



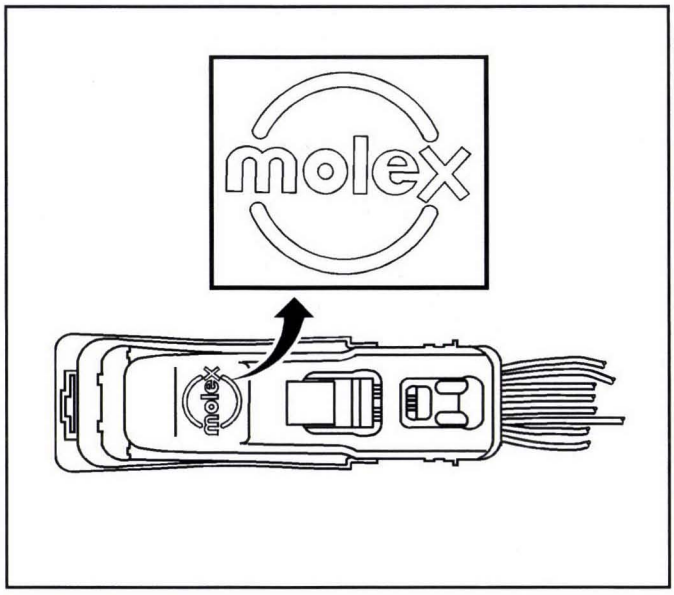
1468768

- JAE connector have JAE in small letters on their connectors.



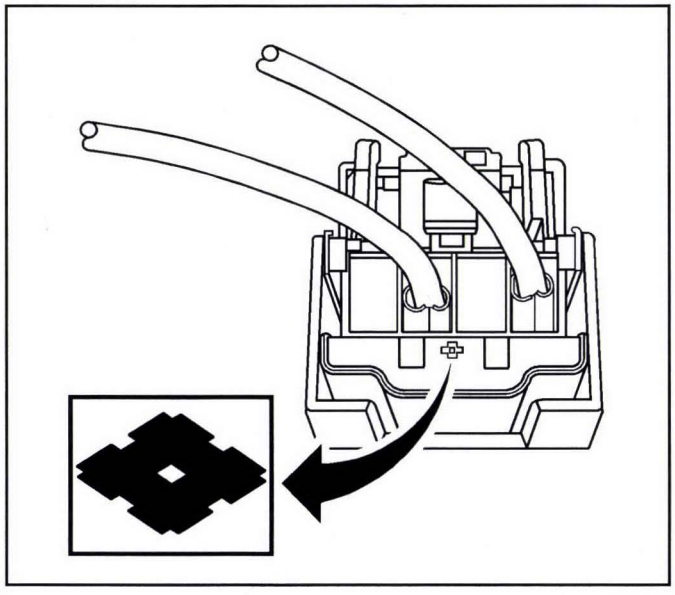
1709340

- Kostel has an ”LK” with a circle around it. These connector are usually used as a transmissions connection.



1467199

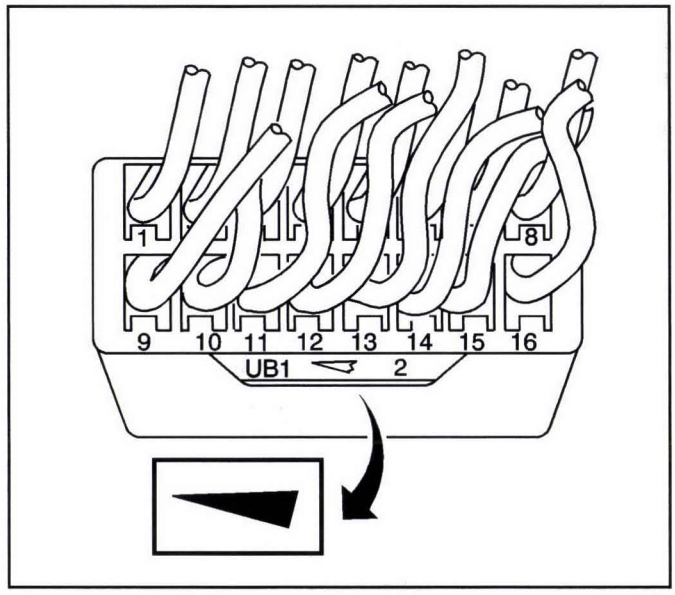
- Most Molex connectors will have the Molex logo on the dresscover of the connector. In some cases the connectors may have MX followed by another letter. The third letter indicates where the connector was made. A connector with MXD is a Molex connector made in Detroit.



1467225

Sumitomo has a unique symbol on their connector and possibly a part number. The symbol is similar to that of a diamond lying on its side, similar to that shown. The logo could appear anywhere but the most common place is at the wire side of the housing.

- Tyco/AMP has many different and unique connector designs. Some may or may not have identifiable marks on them.



1467254

- Yazaki has a wedge or arrow shape, similar to that shown.

Connector Position Assurance Locks

The connector position assurance (CPA) is a small plastic insert that fits through the locking tabs of the connector. CPAs are used in various connectors throughout the vehicle. CPAs are also used in all SIR system electrical connectors. The CPA ensures that the connector halves cannot vibrate apart. You must have the CPA in place in order to ensure good contact between the mating terminals of the connector.

Terminal Position Assurance Locks

The terminal position assurance (TPA) insert resembles the plastic combs used in the control module connectors. The TPA keeps the terminal securely seated in the connector body. Do not remove the TPA from the connector body unless you remove a terminal for replacement. If the TPA is removed, be sure to reinstall it before reconnecting the connector.

AFL/EPC Connectors

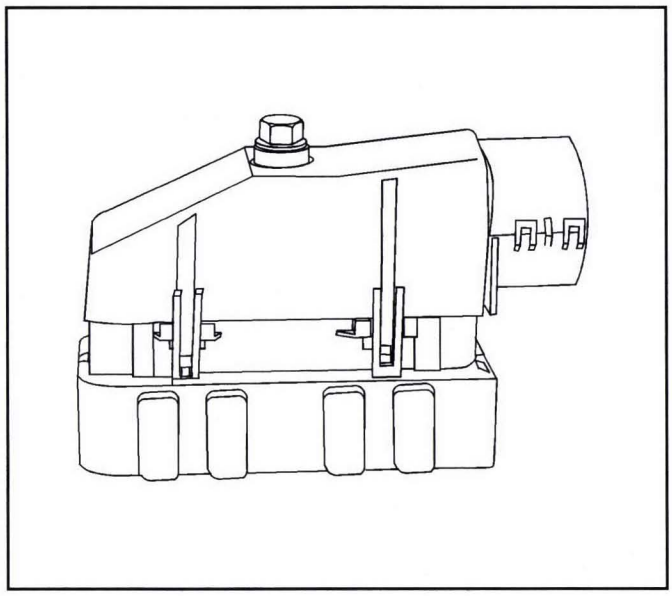
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-12A* Terminal Release Tool
- *J-38125-216* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

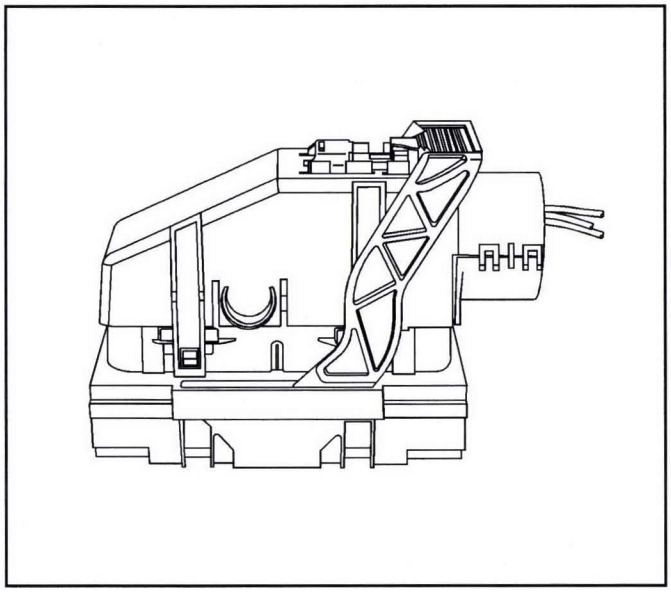
Terminal Removal Procedure

Follow the steps below in order to remove terminals from the connector.



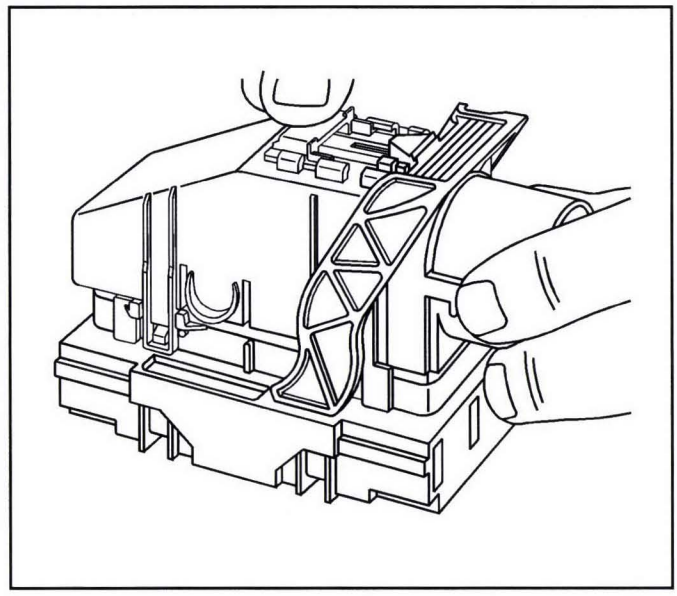
1709283

1. For connectors with a bolt in the dress cover, turn the bolt counterclockwise to remove the connector from the component.



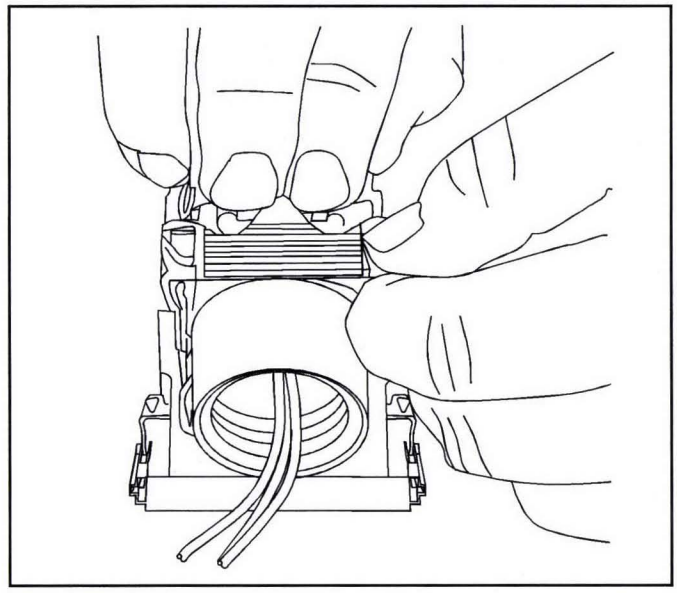
1709284

2. Locate the connector position assurance (CPA) on the top of the wire dress cover. Slide the CPA forward.



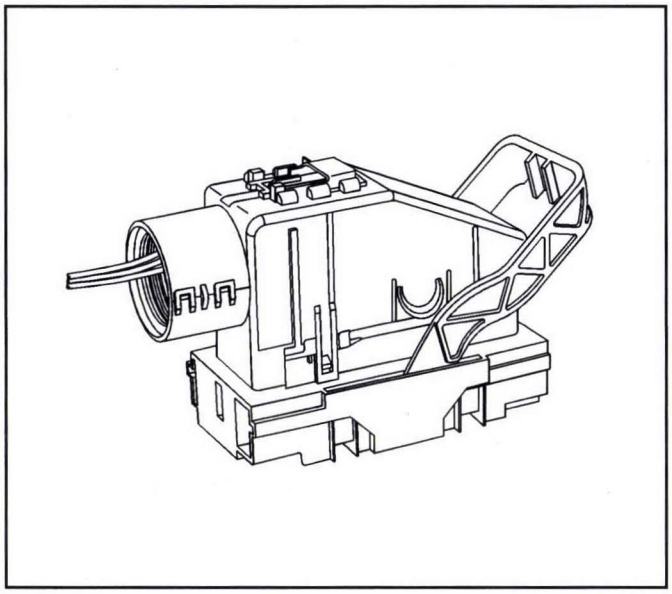
1709285

3. Slide the lever lock forward while pressing down on the lever lock release tab.



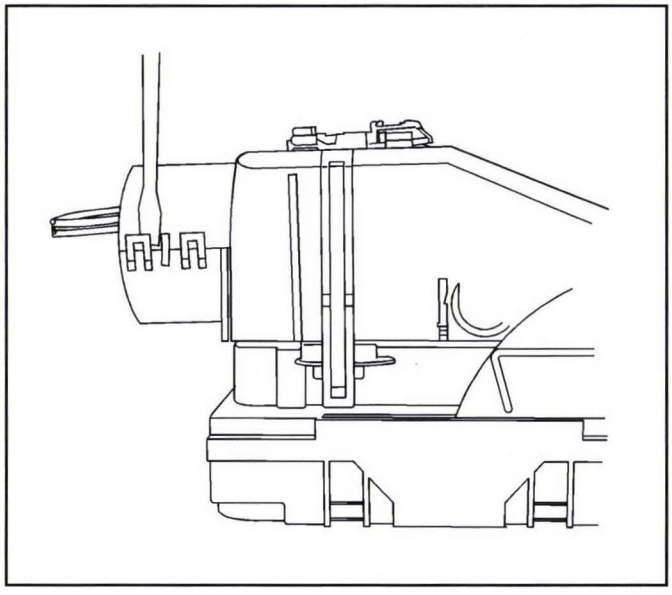
1709286

4. View showing depressing of the lever lock release tab.



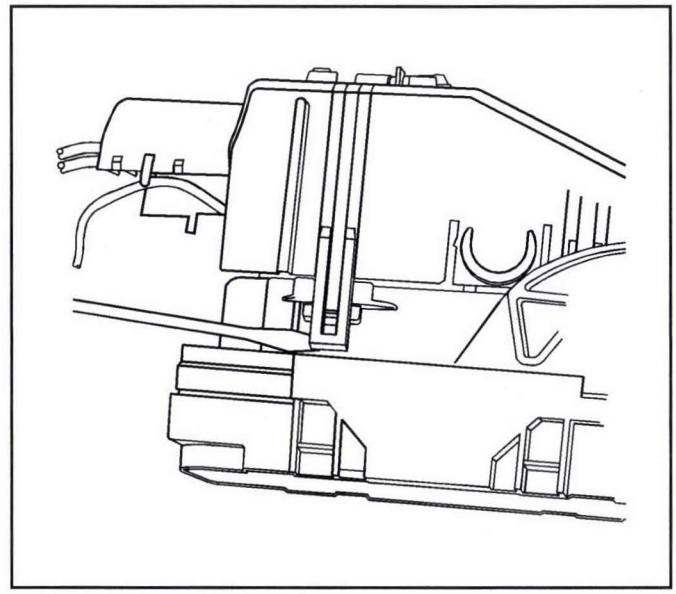
1709287

5. View of connector in released position.
6. Disconnect the connector from the component.
7. Locate the dress cover locking tabs at the corners of the dress cover. Use a small flat-blade tool to release the locking tabs and remove the dress cover.



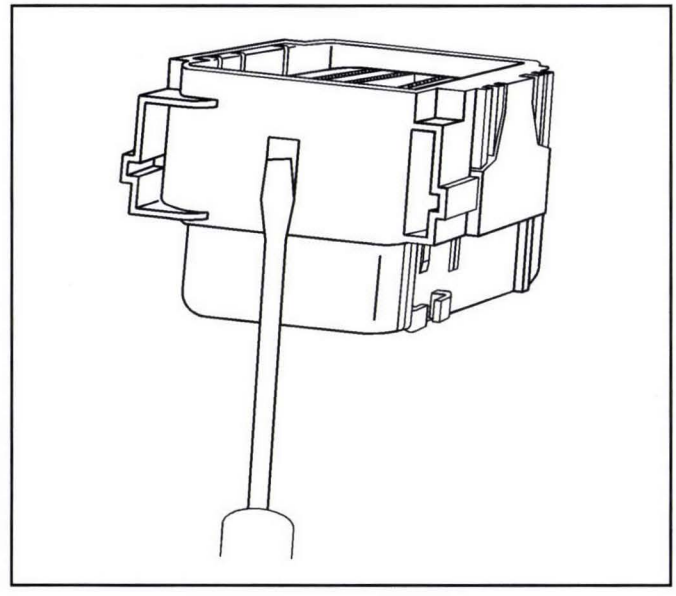
1709288

8. Release the rear lower half of the wiredress cover.



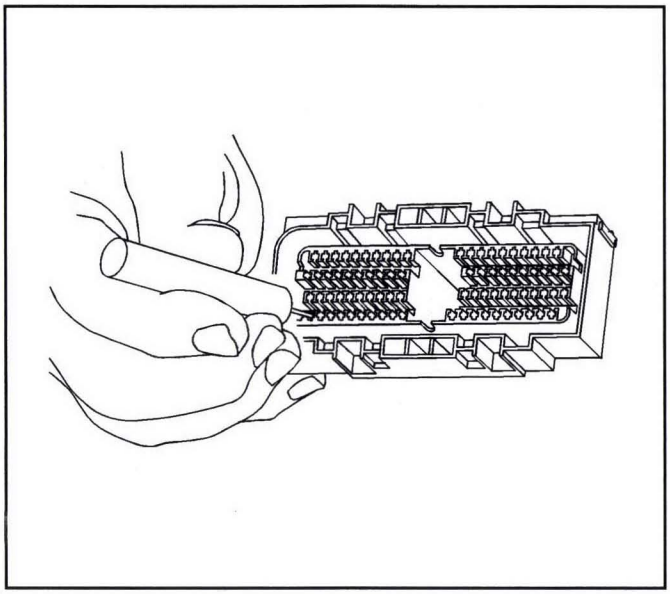
1709289

9. Release the tabs that are holding the wiredress cover to the connector body.
10. Remove the nose piece by inserting a small flat-blade tool into the slots on both ends of the connector body. Gently pry the nose piece out of the connector. J-38125-216 can also be used to remove the nose piece.



1709282

11. Use the J-38125-12A tool to release the terminals by lifting the terminal retaining tabs on the inside of the connector.



1709281

12. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
13. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
14. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Bosch Connectors (BSK)

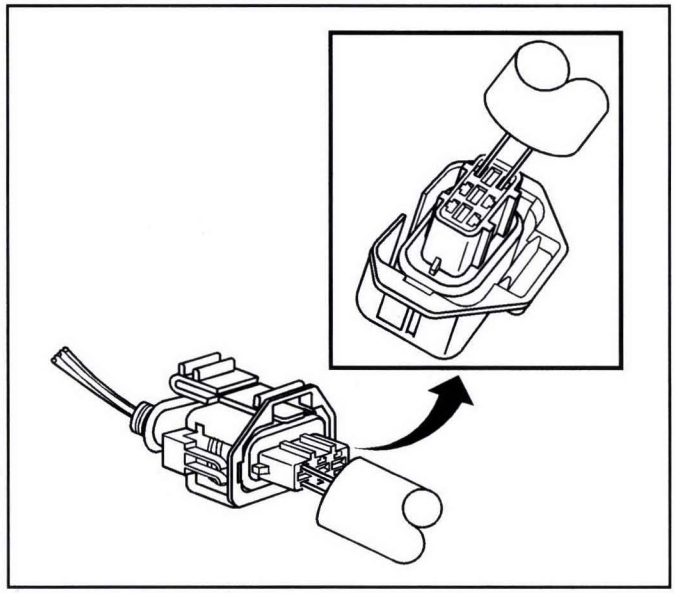
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-561* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure

1. Disconnect the connector from the component.
2. Remove the wire dress cover, if necessary.
3. Push the wire side of the terminal that is being removed toward the connector and hold it in position.



1446346

4. Insert the J-38125-561 tool into the 2 cavities on each side of the terminal at the front of the connector and push until you feel the tool disengage the terminal retainers.
5. Carefully pull the terminal out of the connector. Always remember never use force when pulling a terminal out of a connector. If the terminal is difficult to remove, repeat the entire procedure.
6. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
7. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Bosch Connectors (0.64)

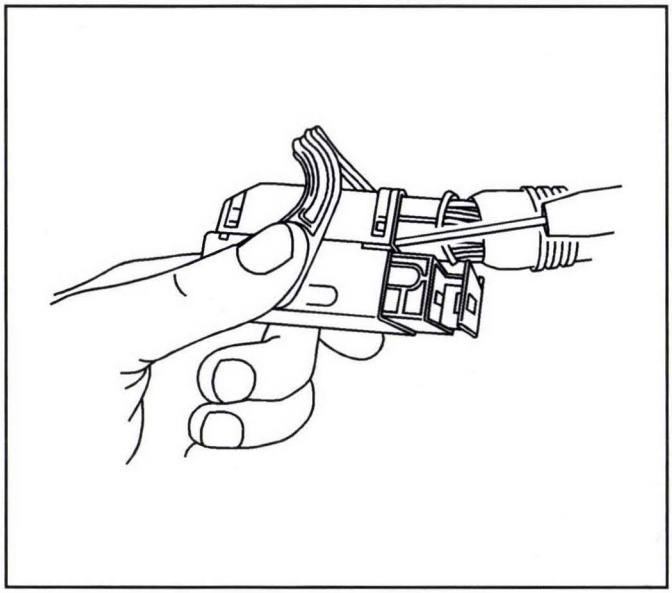
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-560* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

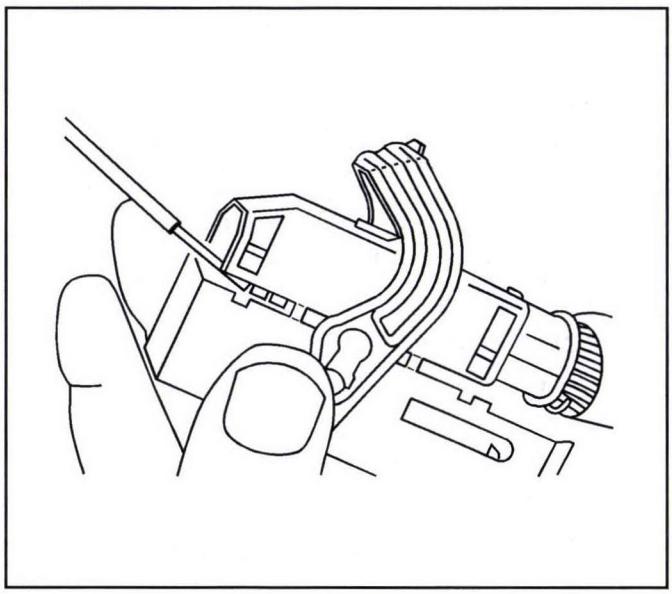
Terminal Removal Procedure

1. Locate the lever lock on the wire dress cover. While pressing the lock, pull the lever over and past the lock until the lever is at the end of its travel.
2. Disconnect the connector from the component.
3. Pull the rubber boot that covers the wires back to expose the end of the connector dress cover.
4. Place the connector locking lever in the center of the connector.



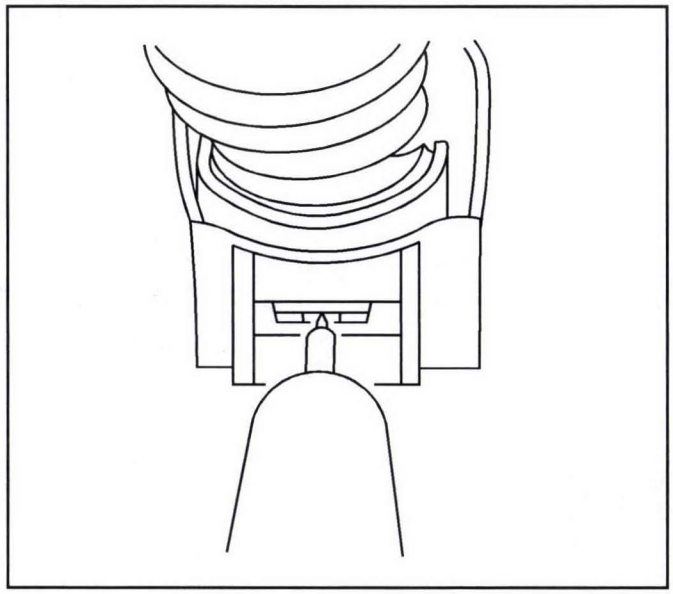
1442703

5. Locate the 2 dress cover locking tabs that are on the wire end of the connector. Insert a small flat-bladed tool between the cover and connector body and pry up.



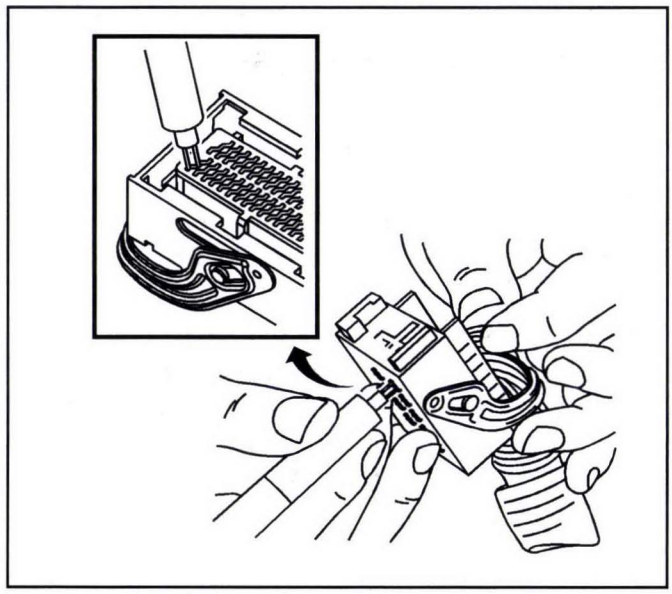
1442709

6. Locate the 2 dress cover locking tabs located on the opposite side of the connector. Insert a small flat-bladed tool between the cover at the connector end and pry up.
7. Remove the dress cover.
8. Cut the tie wrap on the wire bundle.



1442715

9. Remove the terminal position assurance (TPA) by inserting a small flat-bladed tool into the small slot in the end of the slider and pushing on the TPA until it comes out of the connector. When the TPA exits the opposite side of the connector, gasp the TPA and pull it completely out of the connector.
10. Push the wire side of the terminal that is being removed toward the connector and hold it in position.

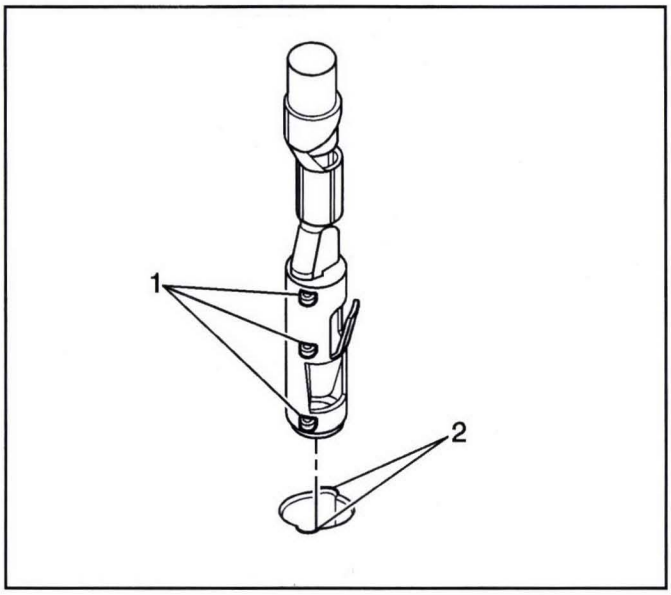


1442734

11. Insert the J-38125-560 into the 2 triangular cavities on each side of the terminal at the front of the connector.
12. Carefully pull the terminal out of the connector. Always remember never use force when pulling a terminal out of a connector. If the terminal is difficult to remove, repeat the entire procedure.

13. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
14. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Terminal Insertion Procedure



1442741

1. Prior to installation the terminal must be aligned so the (1) coding lugs align with the (2) coding grooves on the connector.
2. Once the terminal is aligned, slide the terminal into the cavity until the retainer has engaged in the cavity of the connector.
3. Slide the TPA in the connector body and seat it using a small flat bladed tool. The TPA is seated when it is flush with the contact housing.
4. Secure the wires to the connector body using a tie wrap and replace the dress cover and grommet.

Bosch Connectors (2.8 JPT)

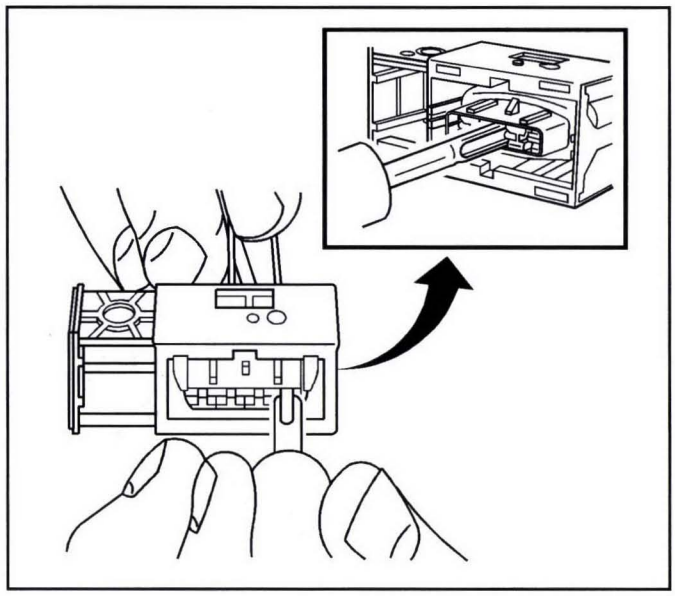
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-557* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure

1. Pull out the slider on the connector position assurance (CPA) until it is at the end of its travel.
2. Disconnect the connector from the component.
3. Remove the wire dress cover, if necessary.
4. Push the wire side of the terminal that is being removed toward the connector and hold it in position.



1445490

5. Insert the J-38125-557 into the 2 cavities on each side of the terminal at the front of the connector and push until you feel the tool disengage the terminal retainers.
6. Carefully pull the terminal out of the connector. Always remember never use force when pulling a terminal out of a connector. If the terminal is difficult to remove, repeat the entire procedure.
7. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
8. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

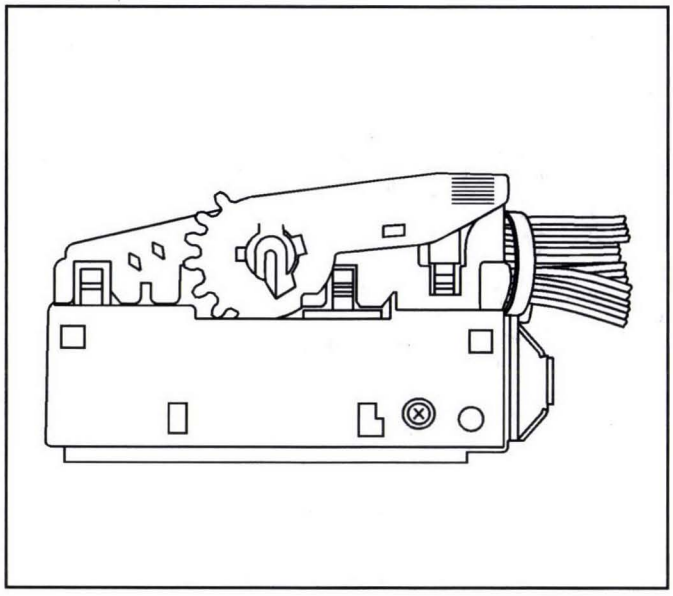
Bosch Connectors (ECM)

Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-213* Terminal Release Tool
- *J-38125-556* Terminal Release Tool

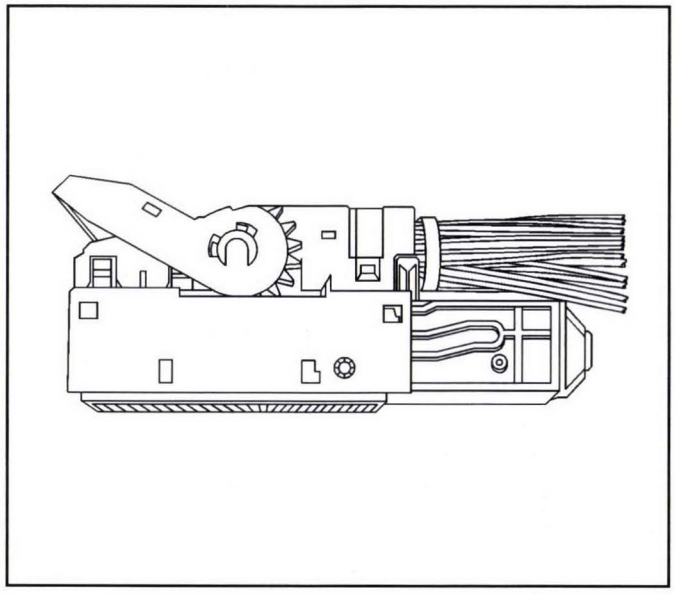
For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure



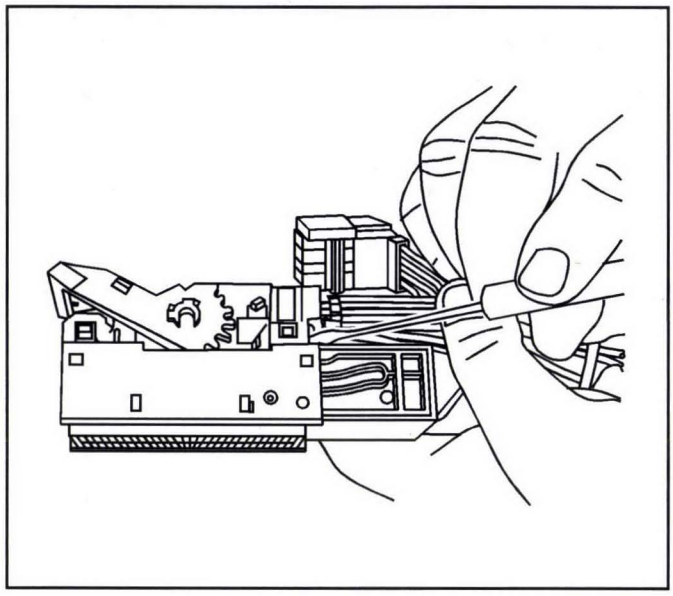
1709276

1. Locate the assist lever on the top of the connector. Move the assist lever to the forward position.



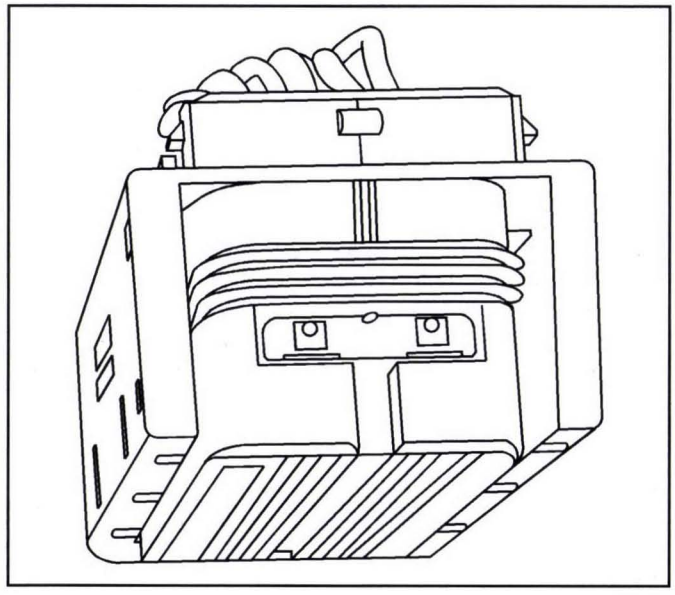
1709277

2. Disconnect the connector from the component.



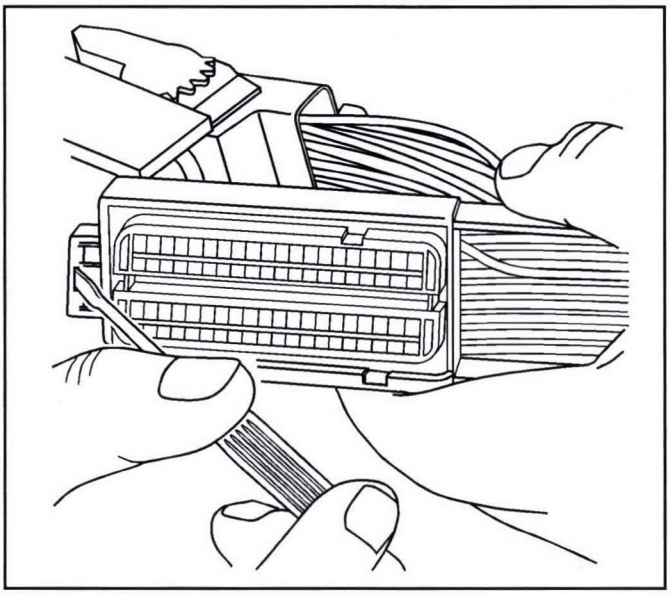
1709273

3. Locate the dress cover locking tabs at the corners of the connector. Use a small flat-blade tool to release the locking tabs and remove the dress cover.



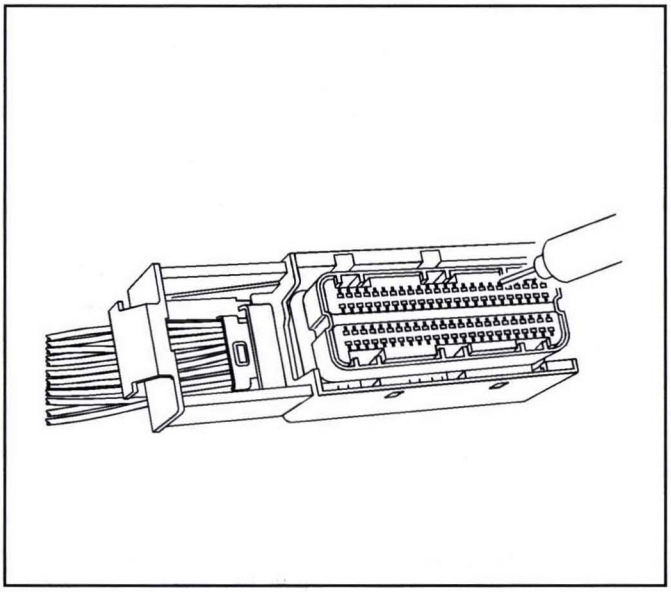
1709274

4. The terminal positive assurance (TPA) is located in the front of the connector.



1709278

5. Use a small flat-blade tool to remove TPA from the connector.



1709275

6. Use the J-38125-213 or the J-38125-556 tool to release the terminals by inserting the tool into the terminal release cavity.
7. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
8. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
9. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Note: Ensure that the dress cover and connector body are both in the released position before reassembling. Failure to do so may cause damage to the connector and component.

10. Reconnect the connector bodies.

Delphi Connectors (Weather Pack)

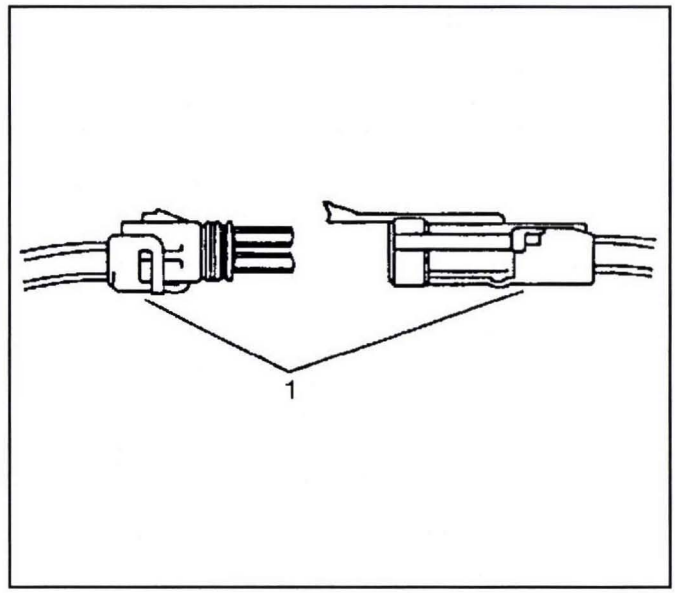
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-10A* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

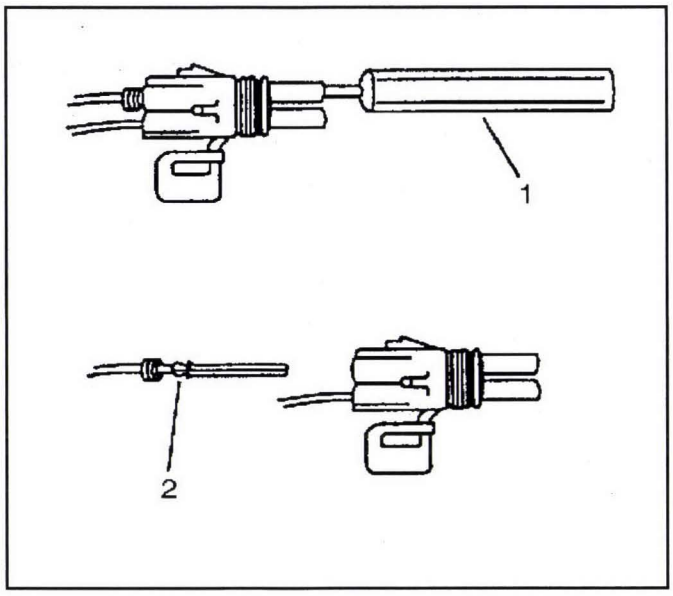
Terminal Removal Procedure

The following is the proper procedure for the repair of Weather Pack® Connectors.



8802

1. Separate the connector halves (1).
2. Open the secondary lock. A secondary lock aids in terminal retention and is usually molded to the connector (1).
3. Grasp the wire and push the terminal to the forward most position. Hold the wire in this position.



8803

4. Insert the Weather Pack® terminal removal tool J-38125-10A into the front (mating end) of the connector cavity until it rests on the cavity shoulder (1).
5. Gently pull on the wire to remove the terminal through the back of the connector (2).

   Note: Never use force to remove a terminal from a connector.
6. Inspect the terminal and connector for damage. Repair as necessary. Refer to *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949*.
7. Reform the lock tang (2) and reset terminal in connector body.
8. Close secondary locks and join connector halves.
9. Verify that circuit is complete and working satisfactorily.
10. Perform system check.
11. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
12. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Delphi Connectors (Push To Seat)

Special Tools

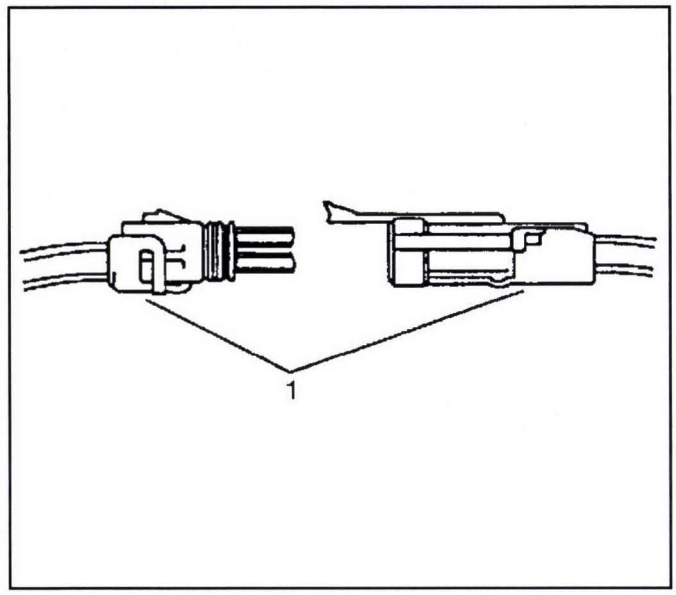
- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure

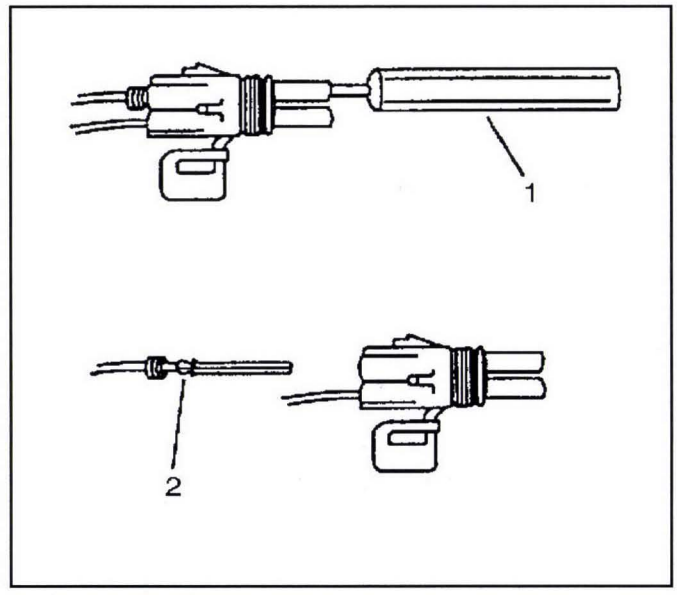
Follow the steps below in order to repair push to seat connectors.

1. Remove the terminal position assurance (TPA) device, the connector position assurance (CPA) device, and/or the secondary lock.



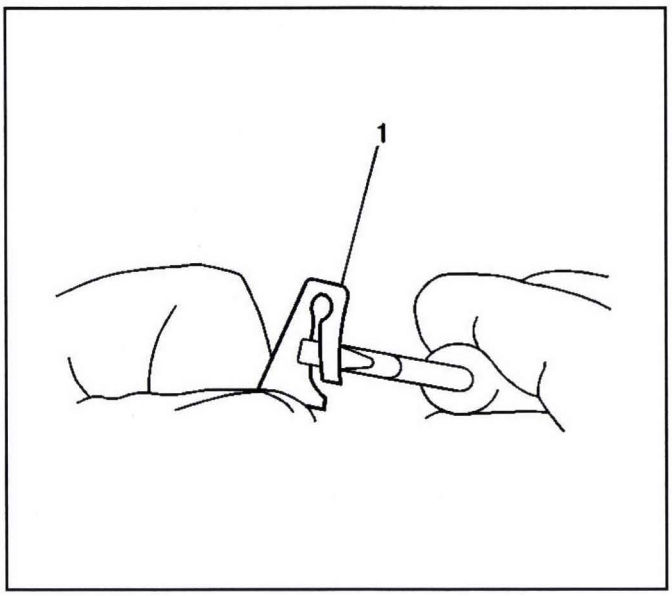
8802

2. Separate the connector halves (1).

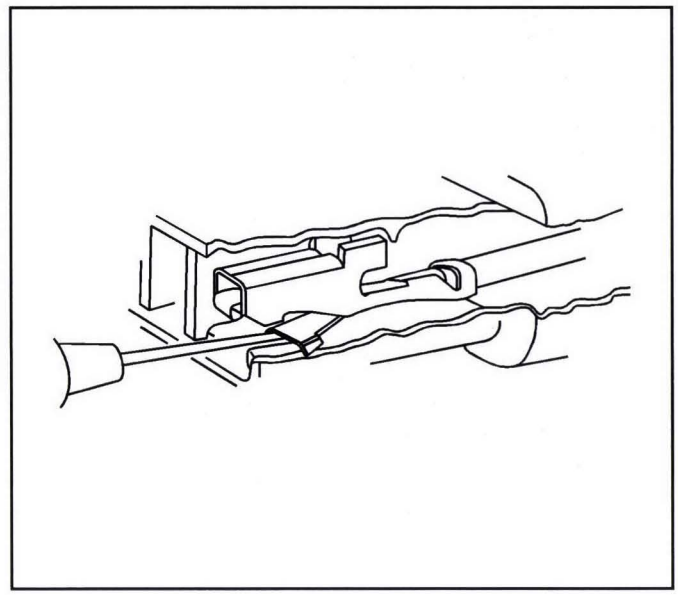


8803

3. Use the proper pick or removal tool (1) in order to release the terminal.
4. Gently pull the cable and the terminal (2) out of the back of the connector.



8804



904718

5. Re-form the locking device if you are going to reuse the terminal (1).
6. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
7. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Terminal Insertion Procedure

1. In order to reuse a terminal or lead assembly, refer to *Wiring Repairs on page 11-883*.
2. Ensure that the cable seal is kept on the terminal side of the splice.
3. Insert the lead from the back until it catches.
4. Install the TPA, CPA, and/or the secondary locks.

Delphi Connectors (Pull To Seat)

Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure

If the terminal is visibly damaged or is suspected of having a faulty connection, the terminal should be replaced.

Follow the steps below in order to repair pull-to-seat connectors:

1. Remove the connector position assurance (CPA) device and/or the secondary lock.
2. Disconnect the connector from the component or separate the connectors for in-line connectors.
3. Remove the terminal position assurance (TPA) device.
4. Review the connector end view to determine the proper test probe and release tool.
5. Insert the release tool into the front of the connector body.
6. Grasp the wire at the back of the connector body and gently push the terminal out the front of the connector body.
7. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
8. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Terminal Insertion Procedure

1. Align the terminal and pull the wire from the back of the connector in order to seat the terminal.
2. If the connector is outside of the passenger compartment, apply dielectric grease to the connector.
3. Install the TPA, CPA, and/or the secondary locks.

Delphi Connectors (Micro-Pack 100W)

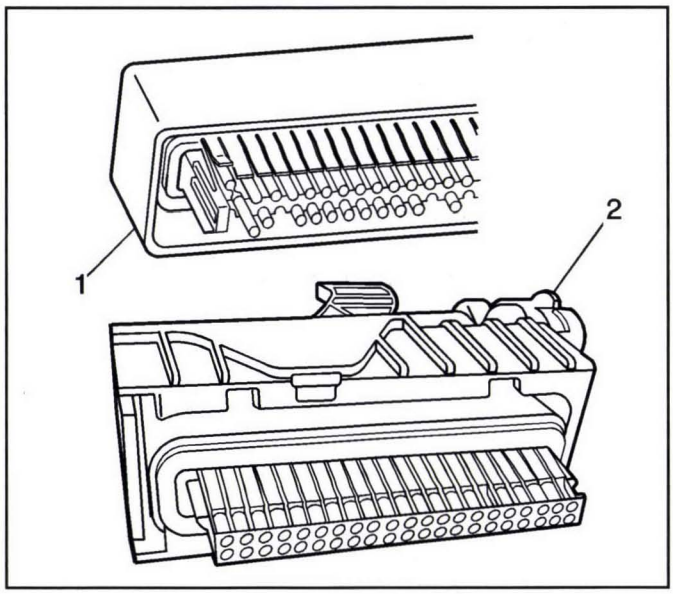
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-12A* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963.*

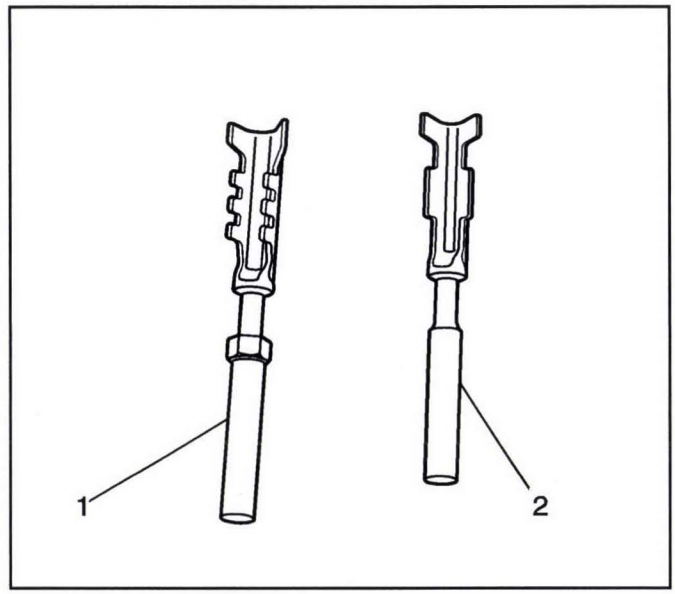
Terminal Removal Procedure

There are 2 styles of Micro-Pack 100W connectors. These connectors are very similar but use different terminals and have some minor physical differences also.



1364951

The first connector design of the Micro-Pack 100W (1) has a white connector interface that holds the terminals. The second design of the Micro-Pack 100W (2) has a gray interface to hold the terminals. Also, the first design has terminal cavities that are further apart (3 mm centerline) and offset from the other row of terminal cavities in the connector. The second design has terminals cavities that are closer together (2.54 mm centerline) and aligned vertically. One other way to identify the second design is the thin strip of material that runs along the outside of the cavities.

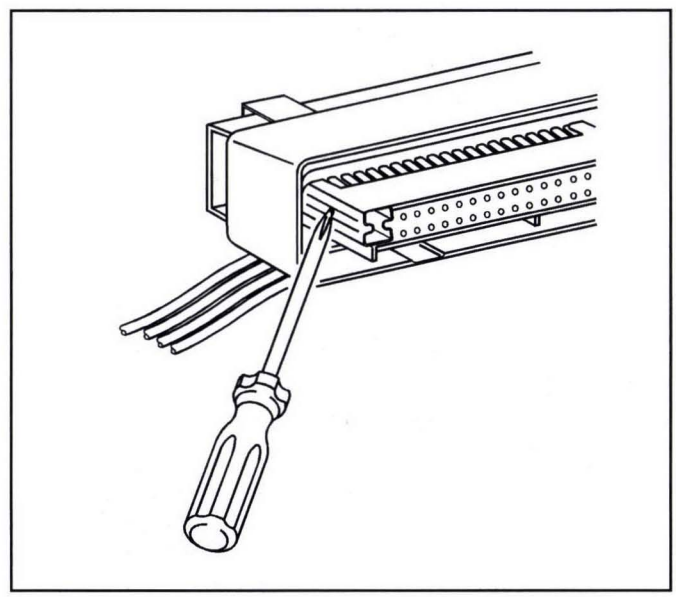


1364942

Note: There are 2 styles of Micro-Pack 100W terminals which are very similar. Ensure that you have the correct terminal before crimping the new terminal to the wire. The first design connector uses the longer terminal (1) that has a raised area in front of the recess in the terminal. The second design connector uses the shorter terminal without the raised area.

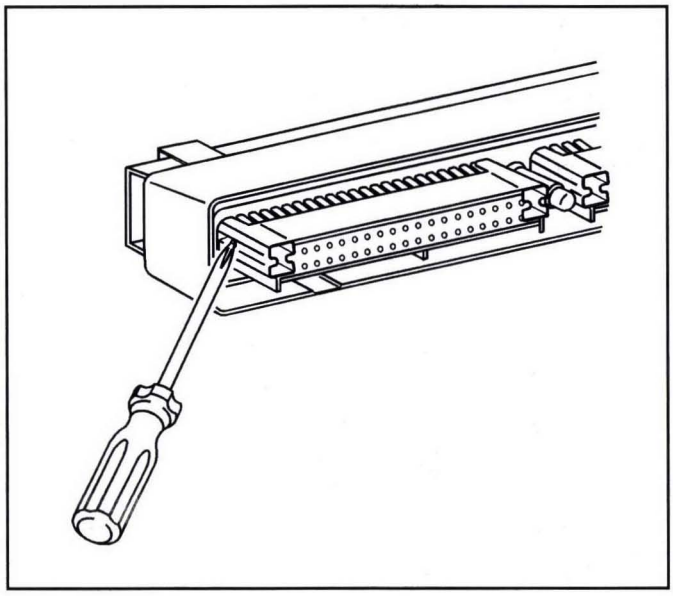
Follow the steps below in order to remove terminals from Micro-Pack 100W connectors. Some Micro-Pack 100W connector disassembly procedures will vary. Use this procedure as a guide.

1. Disconnect the connector from the component.



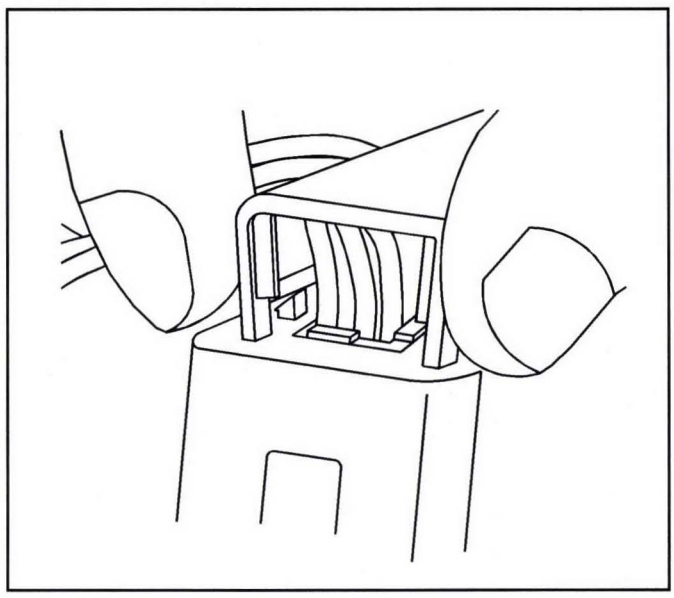
880994

2. Locate the nose piece locking tabs that are positioned on the side of the connector nose piece. The connector nose piece acts as a terminal positive assurance (TPA) and may be referred to as such.



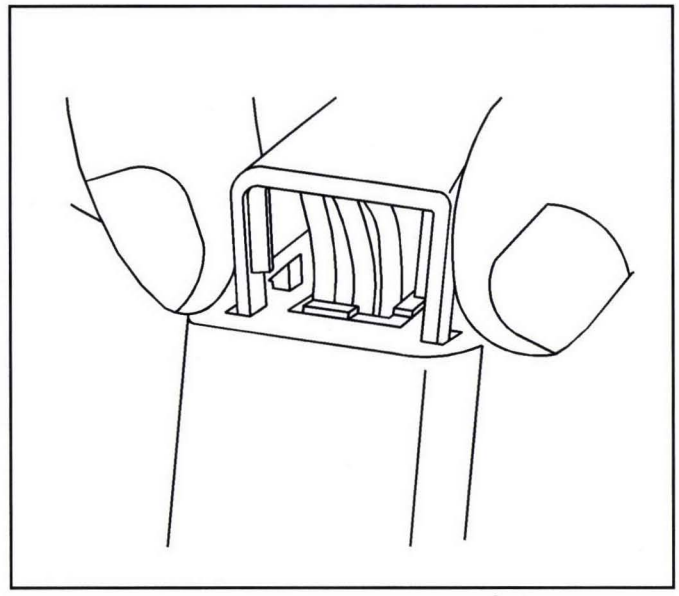
881004

3. Use a small flat-blade tool to push in one of the locking tabs while gently pulling on the same side of the nose piece.
4. Repeat the procedure for the other locking tab and remove the nose piece.
5. Remove the wire dress cover. The following is a general procedure for wire dress cover removal. Use this procedure as a guide, some dress cover removal procedures may vary.



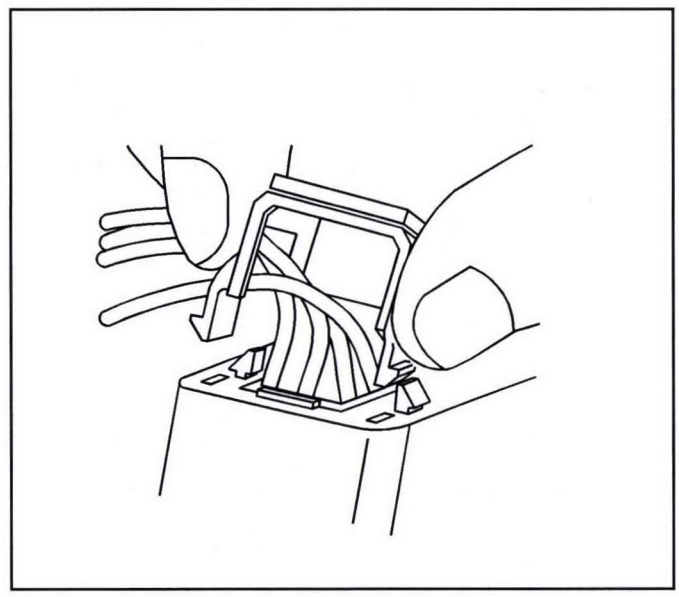
881006

6. Use fingers to squeeze the 2 locking legs of the cover.



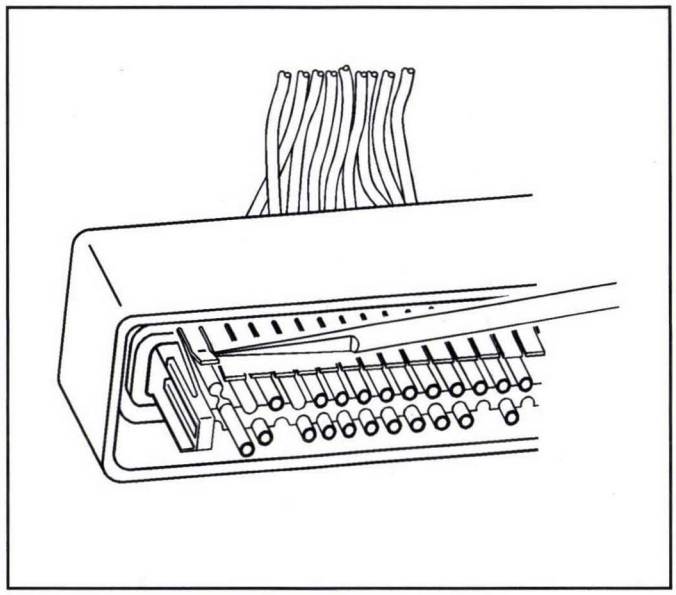
881008

7. Apply pressure and gently rock the cover until one locking leg is unseated.



881011

8. Continue to apply pressure and rock the cover until the second locking leg is unseated. Repeat procedure for the other side of the dress cover and remove the cover.



881017

9. Use J-38125-12A to gently lift the terminal retaining tab while gently pulling the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
10. If the terminal is severely bent or damaged, it may be possible on some connectors to push the wire out of the front of the connector instead of pulling it through. This will prevent damage to the internal seals of the connector. Once the terminal is pushed out of the connector, cut the wire as close to the terminal as possible and pull the wire through the connector.
11. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
12. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Terminal Insertion Procedure

After the terminal is crimped to the wire perform the following procedure in order to replace Micro-Pack 100 terminals.

1. Slide the new terminal into the correct cavity at the back of the connector.
2. Push the terminal into the connector until it locks into place. The new terminal should be even with the other terminals. Ensure that the terminal is locked in place by gently pulling on the wire.
3. To assemble the connector, reverse the Terminal Removal Procedure.

Delphi Connectors (Micro .64)

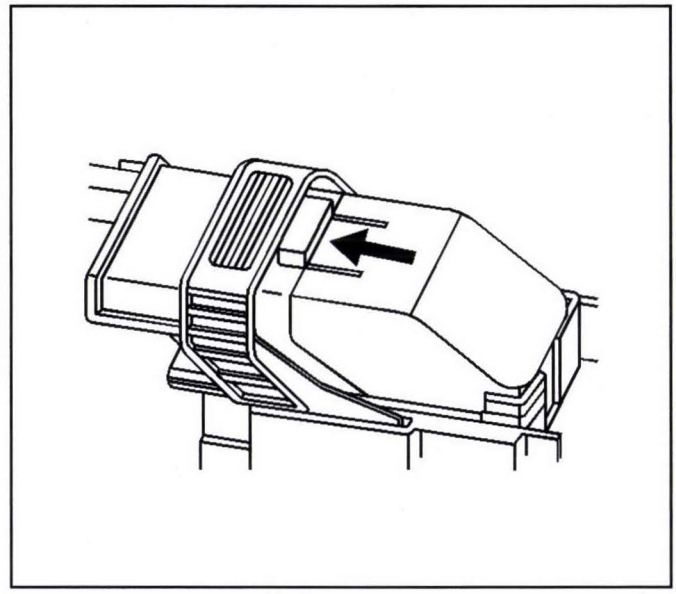
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-21* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

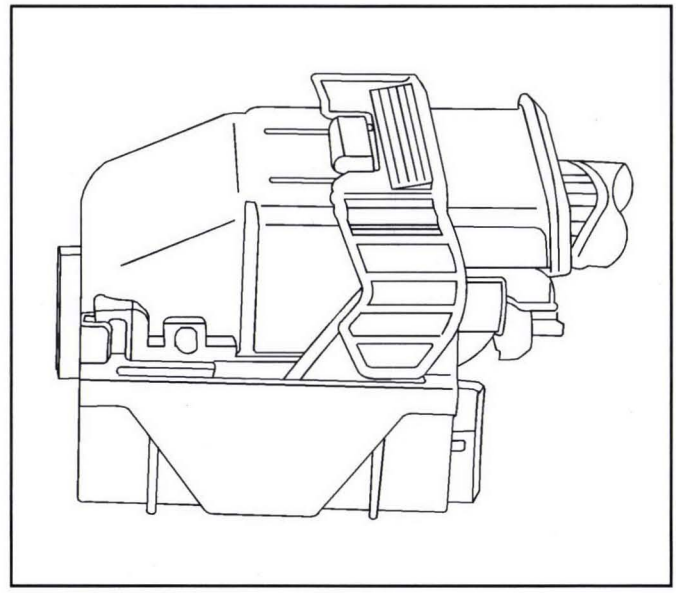
Terminal Removal Procedure

Follow the steps below in order to remove terminals from Micro .64 connectors.



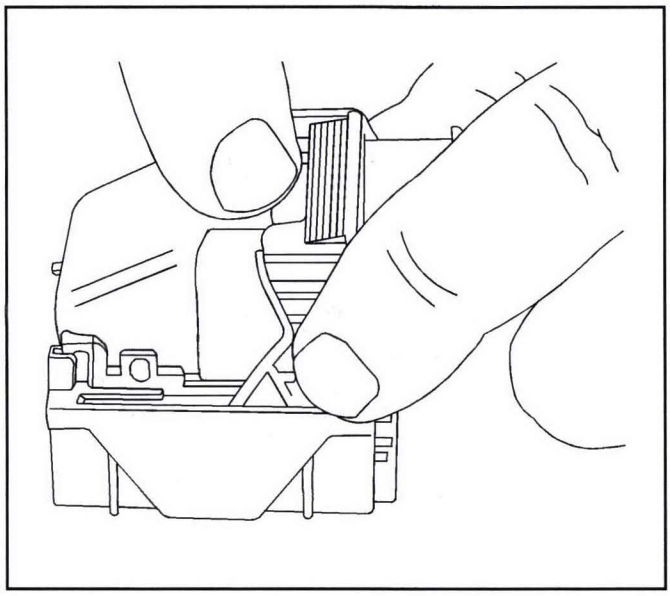
863406

1. Locate the lever lock on the wire dress cover. While depressing the lock, pull the lever over and past the lock. The lever lock may be located on the top or sides of the wire dress cover.



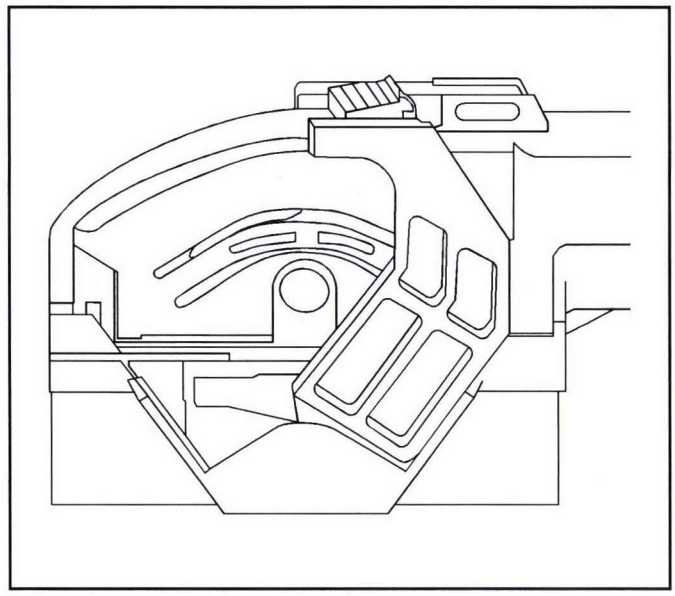
1709337

View of a typical Micro 64 connector.



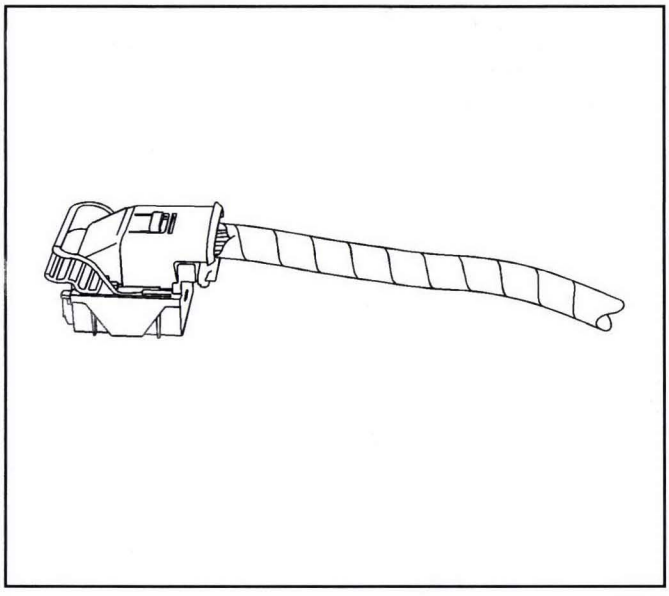
1709338

Depress the lock and pull the lever over and past the lock.



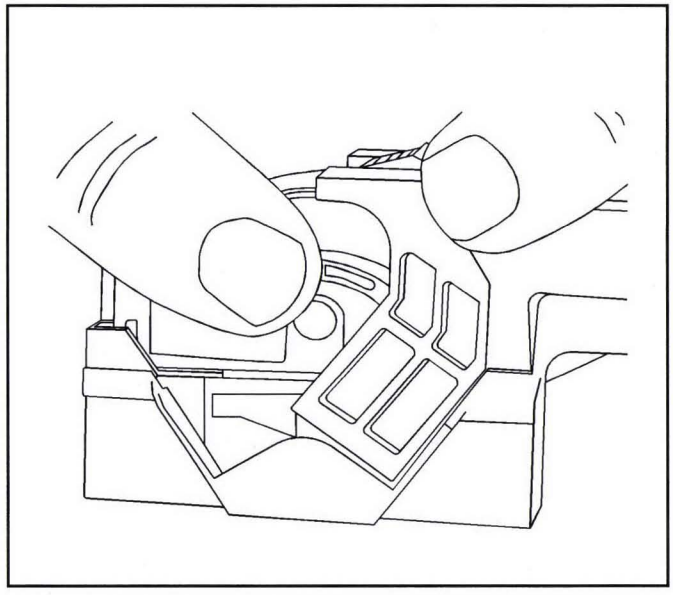
1709290

View of another type of Micro 64 connector.



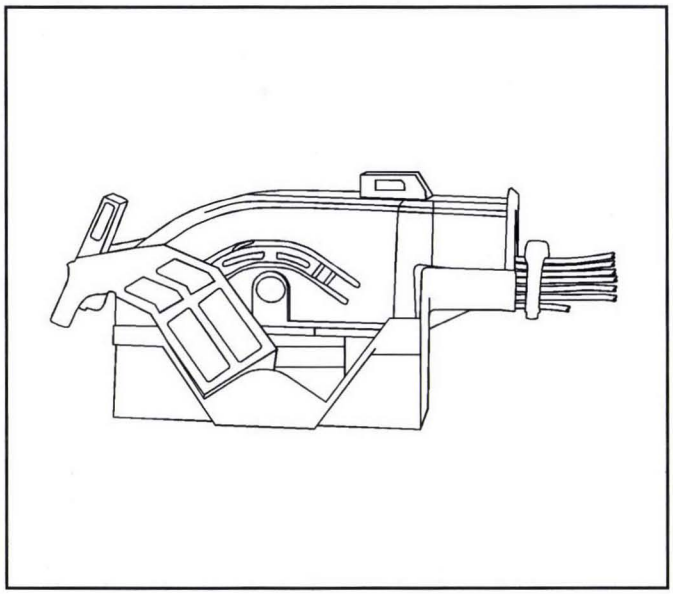
1709339

View of the connector when released from the component.



1709291

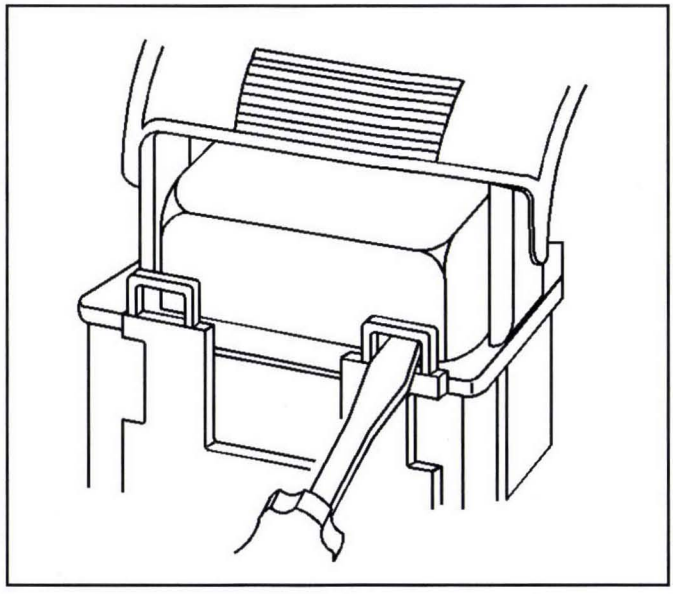
Depress the locks that are located on both sides of the wire dress cover and pull the lever over and past the locks.



1709292

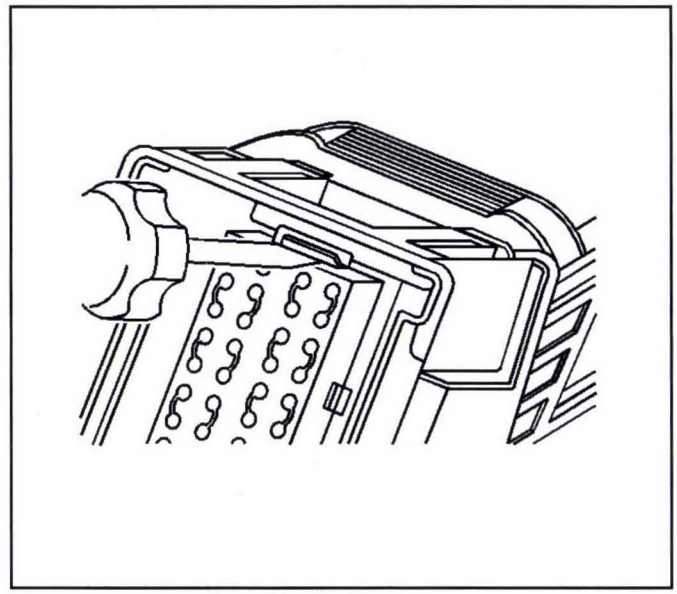
View of the connector when released from the component.

2. Disconnect the connector from the component.



863404

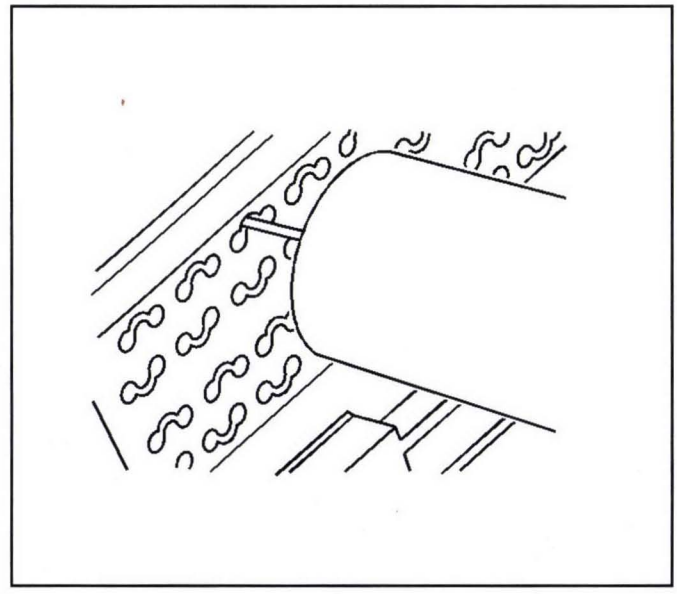
3. Locate the dress cover locking tabs at the front of the connector. Using a small flat-blade tool push down on one of the locking tabs and pull the cover up until the dress cover releases. Repeat this procedure for the other locking tab.
4. Once the front 2 locks are unlocked, lift the front of the dress cover and pull it forward.



863400

Note: Always use care when removing a terminal position assurance (TPA) in order to avoid damaging it.

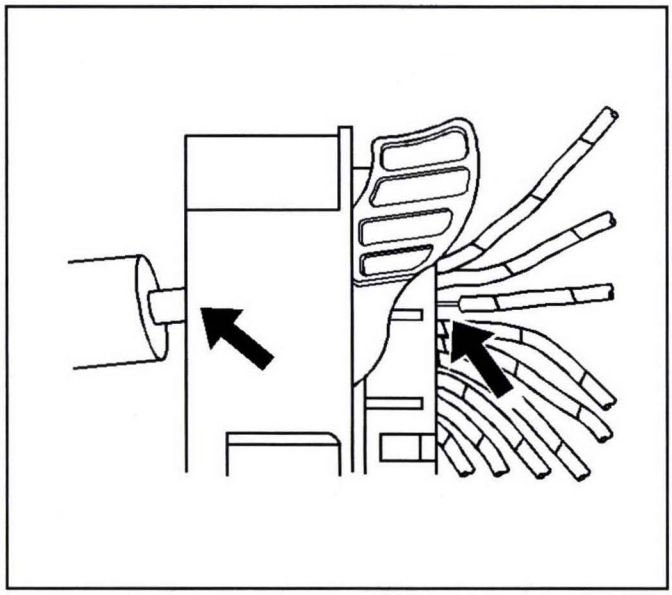
5. Remove the TPA by inserting a small flat-blade tool into the small slot on the TPA and pushing down until the TPA releases. Gently pry the TPA out of the connector.



863397

Note: Be careful not to angle or rock the J-38125-21 tool when inserting it into the connector or the tool may break.

6. Insert the J-38125-21 tool into the round canal between the terminals cavities at the front of the connector.



863390

7. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
8. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
9. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Delphi Connectors (12-Way)

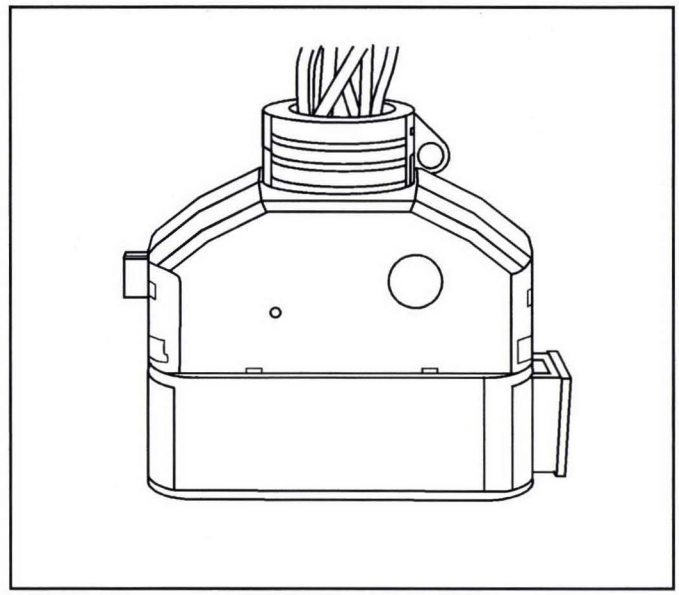
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-12A* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

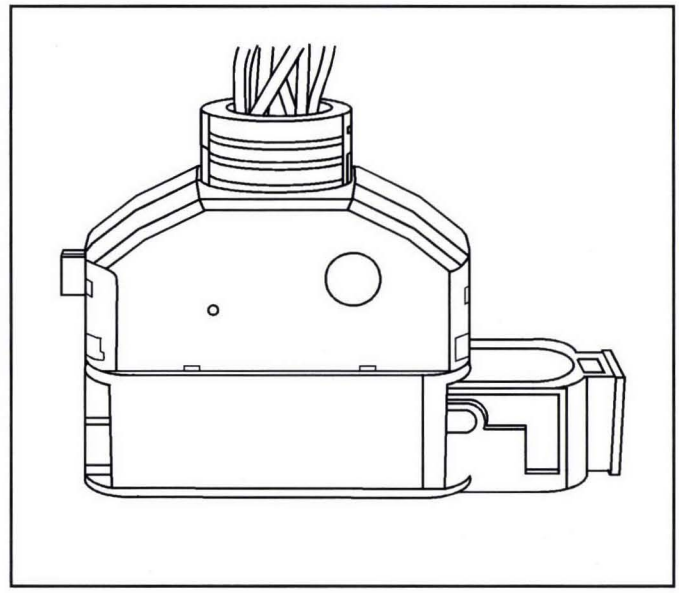
Terminal Removal Procedure

Follow the steps below in order to remove terminals from the connector.



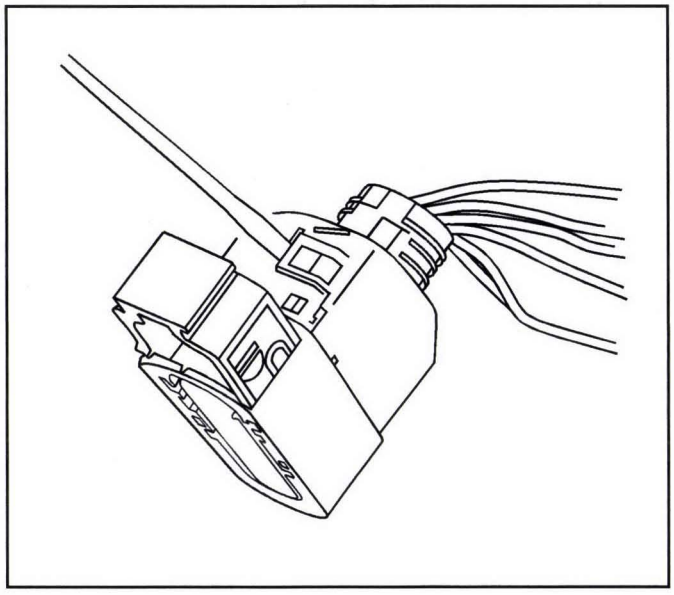
1709308

1. Locate the lever lock on the wire dress cover. Remove the connector position assurance (CPA) and slide the lever lock away from the connector body.
2. Disconnect the connector from the component.



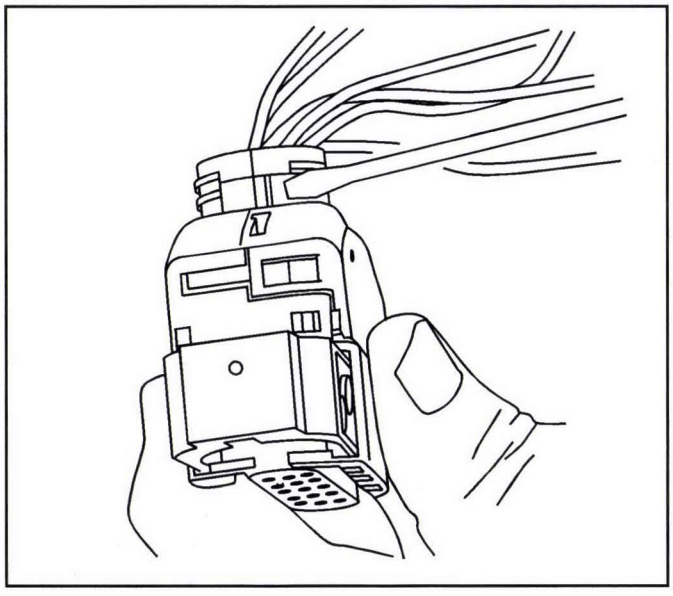
1709309

3. Locate the dress cover locking tabs on the dress cover of the connector. Using a small flat-blade tool release all of the locking tabs.



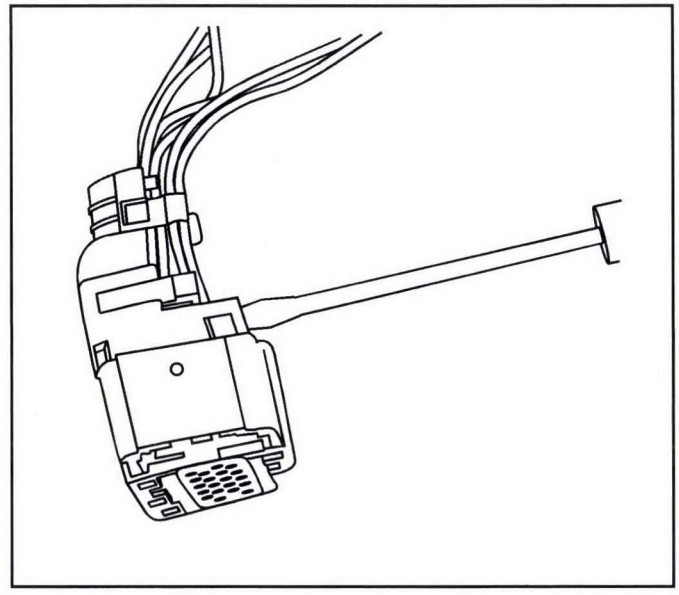
1709311

4. Release the lower wire dress cover locking tab.



1709312

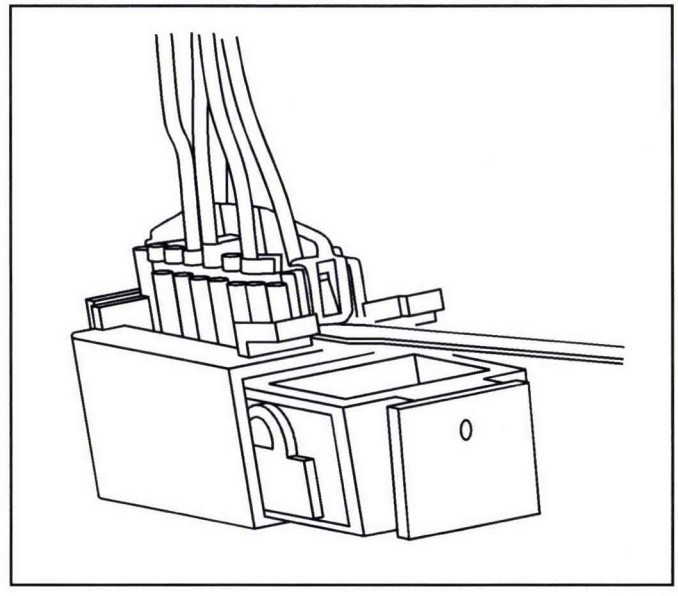
5. Release the upper wire dress cover locking tab.
6. Once the locks are unlocked, lift the dress cover off.



1709313

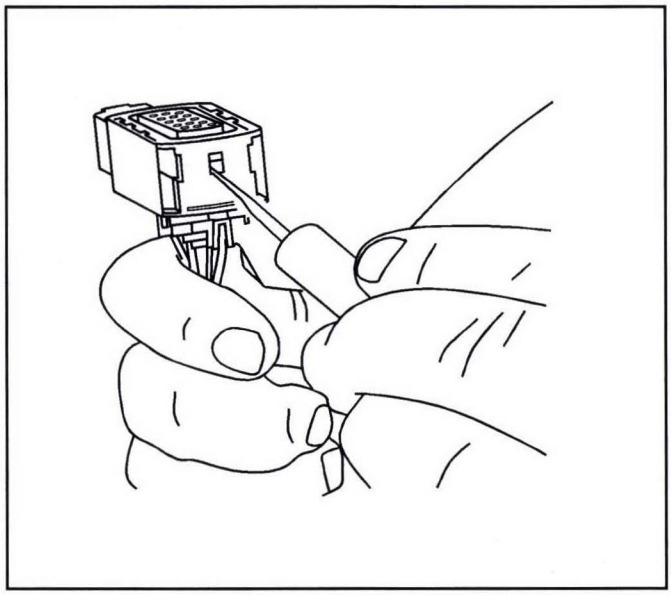
Note: Always use care when removing a terminal position assurance (TPA) in order to avoid damaging it.

7. Remove the TPA by inserting a small flat-blade tool into the locking tabs on both sides of the TPA . Gently pry the TPA out of the connector.



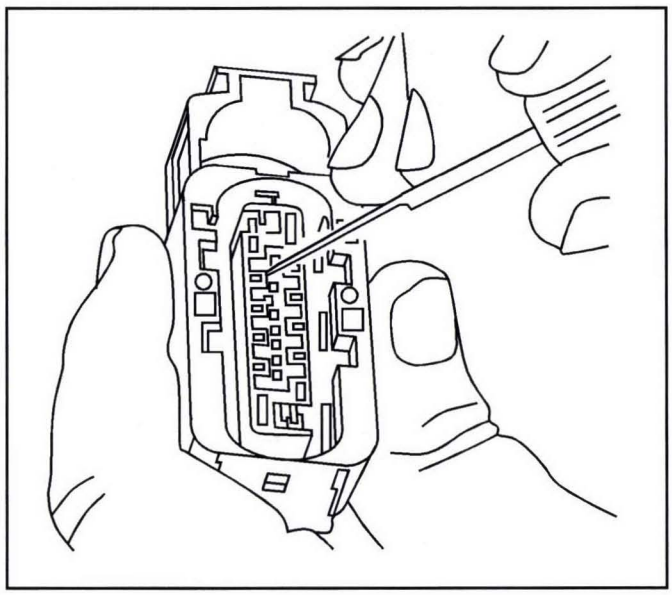
1709314

8. Remove the nose piece by inserting a small flat-blade tool into the locking tabs on both sides of the nose piece. Gently pry the nose piece out of the connector.



1709315

9. Insert the J-38125-12A tool to release the terminals by inserting the tool into the terminal release cavity.

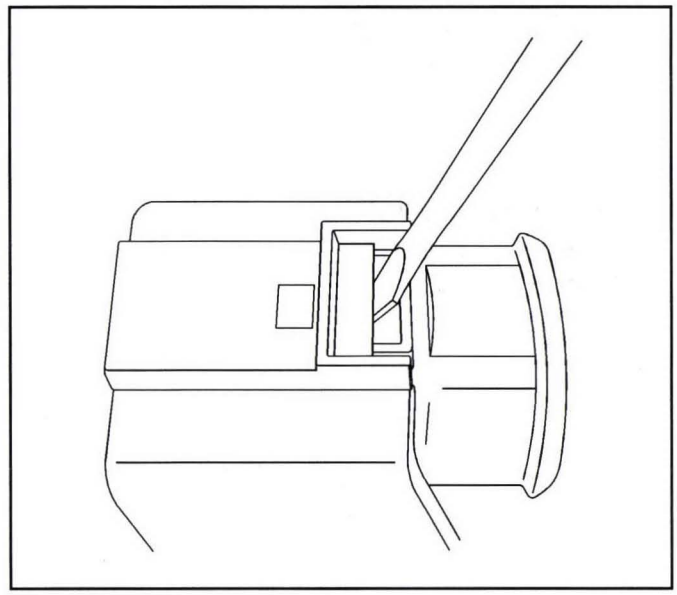


1709316

10. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
11. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
12. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

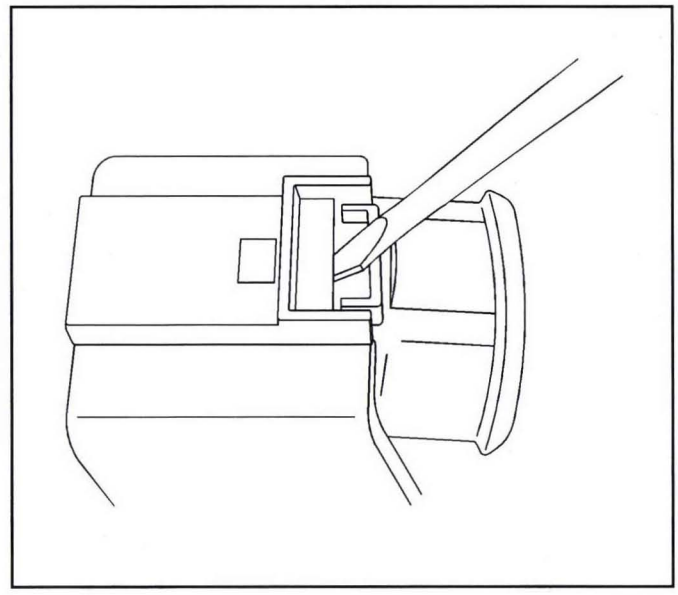
Delphi Connectors (Steering Gear)

Removal Procedure



2374629

1. Use a small flat-bladed tool to release the locking tab on the connector.



2374631

2. Push down the locking tab to release the connector. The small flat-bladed tool may need to be pushed down and angled back slightly to depress the locking tab. Pull on the connector body while releasing the locking tab to disconnect the connector.

FCI Connectors (Lever Lock)

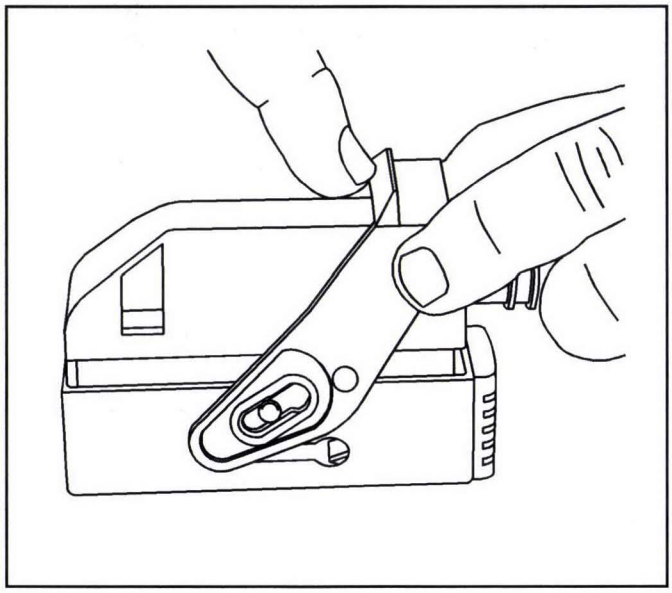
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-556* Terminal Release Tool
- *J-38125-560* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

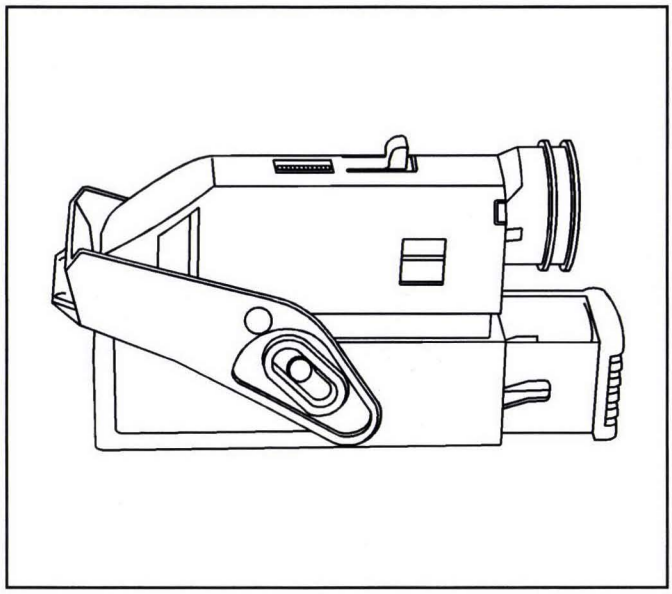
Terminal Removal Procedure

Follow the steps below in order to remove terminals from the connector.



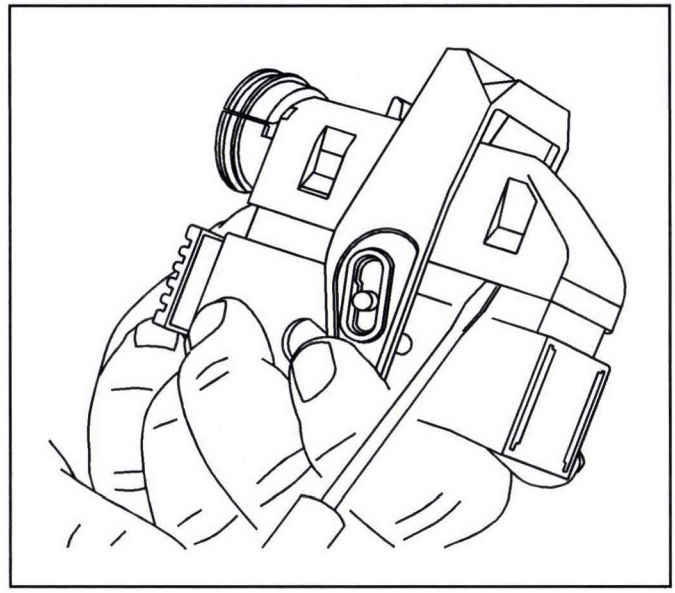
1709268

1. Slide the lever lock forward while pressing down on the lever lock release tab.
2. The release tab is located on the top of the wiredress cover.



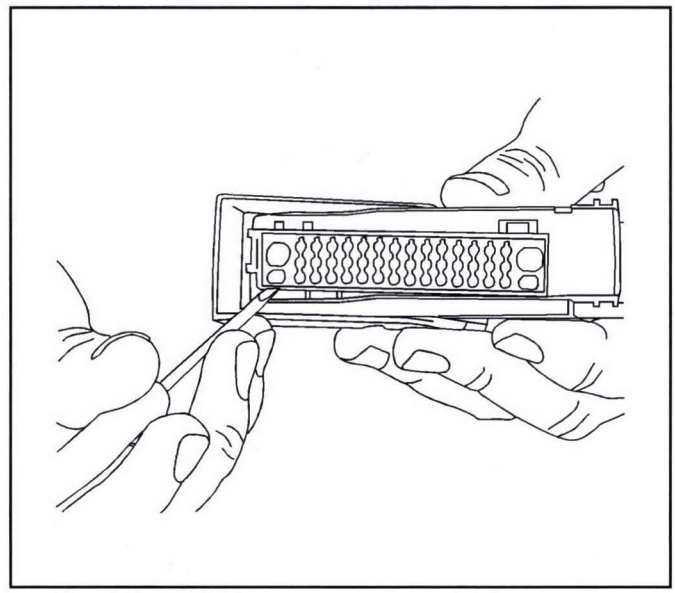
1709269

3. View of connector in released position.
4. Disconnect the connector from the component.
5. Locate the dress cover locking tabs at the corners of the dress cover. Use a small flat-blade tool to release the locking tabs and remove the dress cover.



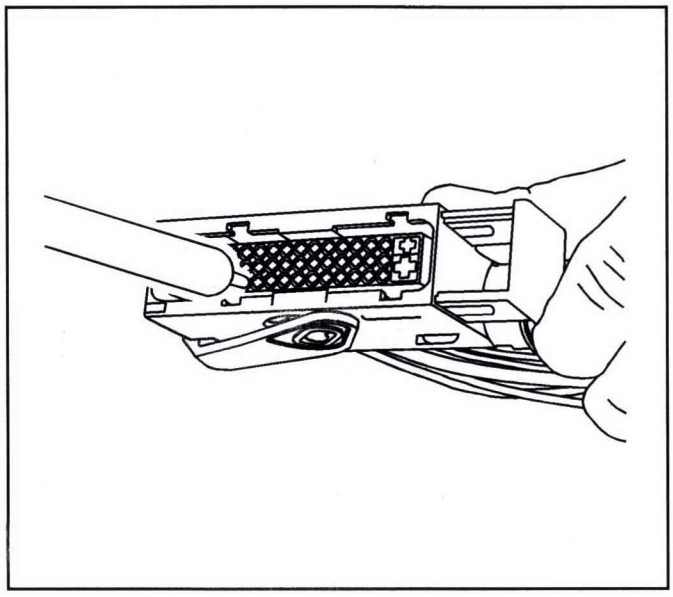
1709270

6. Use a small flat-blade tool to slide the terminal position assurance (TPA) up one notch on both ends of the connector. The TPA is located underneath the wire dress cover.



1709271

7. For the larger terminals insert the J-38125-556 tool to release the terminals by inserting the tool into the terminal release cavity. For the smaller terminals insert the J-38125-560 tool to release the terminals by inserting the tool into the terminal release cavity.



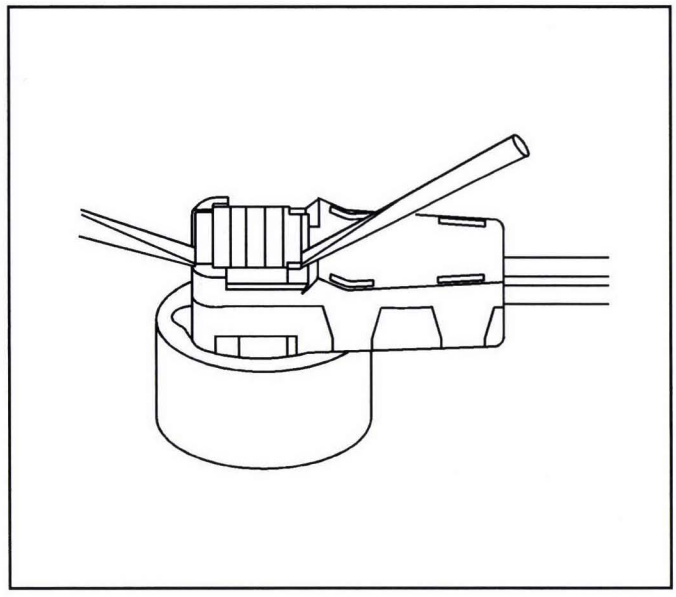
1709272

8. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
9. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
10. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

FCI Connectors (SIR)

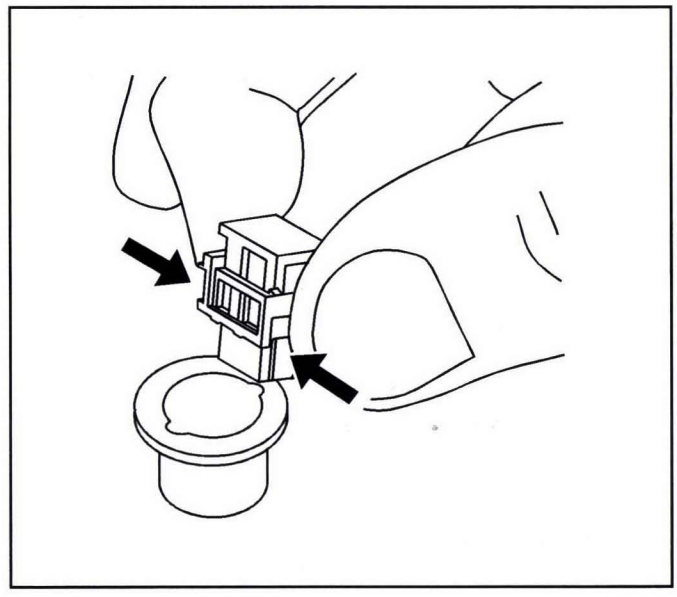
Removal Procedure

Note: The orange or yellow connector position assurance (CPA) must be released first to disconnect or to connect the connector.



2374625

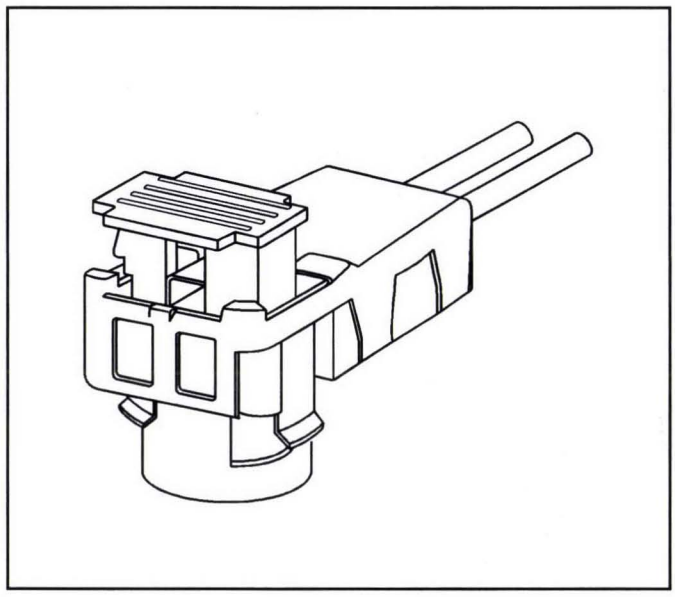
1. Lift the orange or yellow CPA vertically (avoid lifting on an angle to the connector) approximately 4 mm to release the connector. Use a small flat-bladed tool to help release the CPA. The CPA may also be released manually without any tools.



3258545

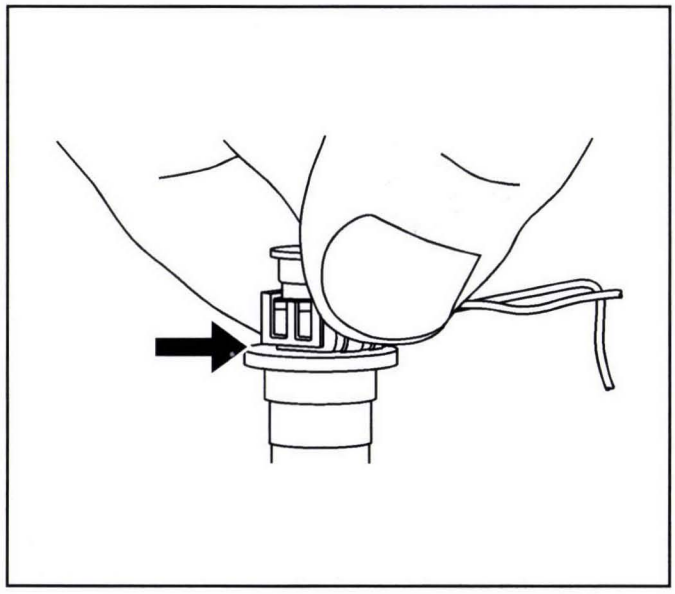
2. Grab the connector on both sides and lift vertically to disconnect the connector.

Installation Procedure



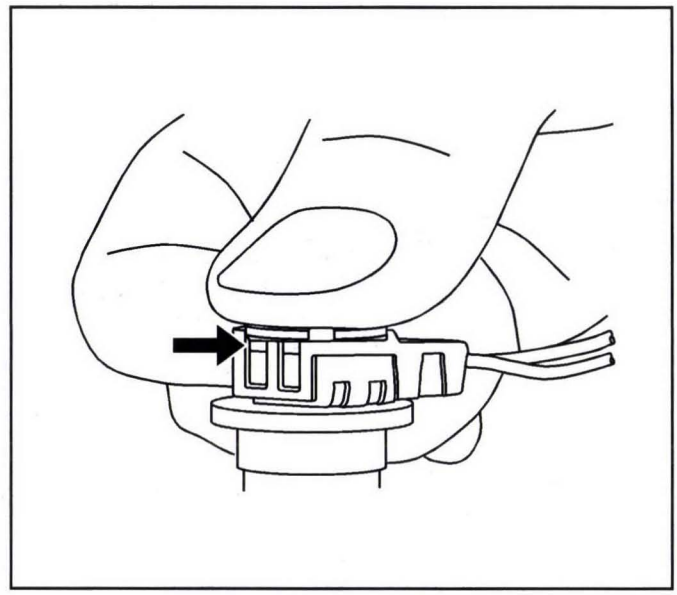
2374626

1. The CPA should be approximately 4 mm above the yellow cover before installing the connector. If not, use a small flat-bladed tool to help release the CPA. The CPA may also be released manually without any tools.



3258546

2. Line up the connector key tabs with the initiator key slots. Grab the connector on both sides and push down into the initiator connector sub assembly until fully seated.

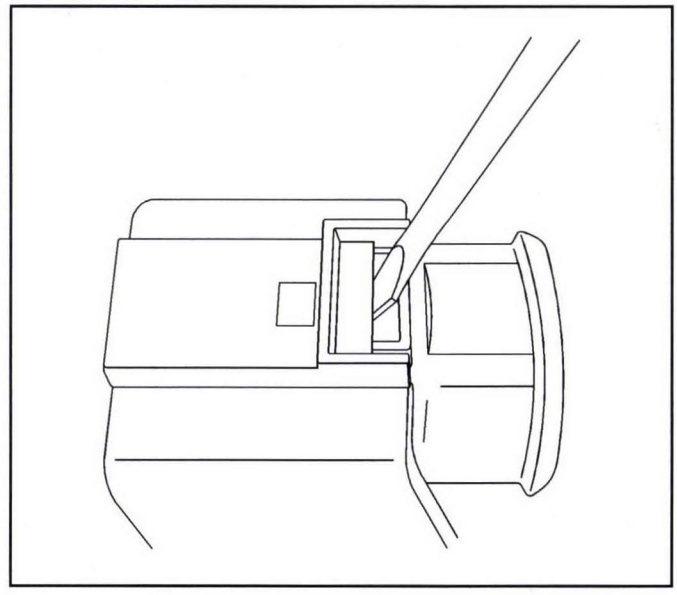


3258548

3. After the connector is fully seated, push the CPA down with your thumb until the CPA is touching the yellow cover on the connector.

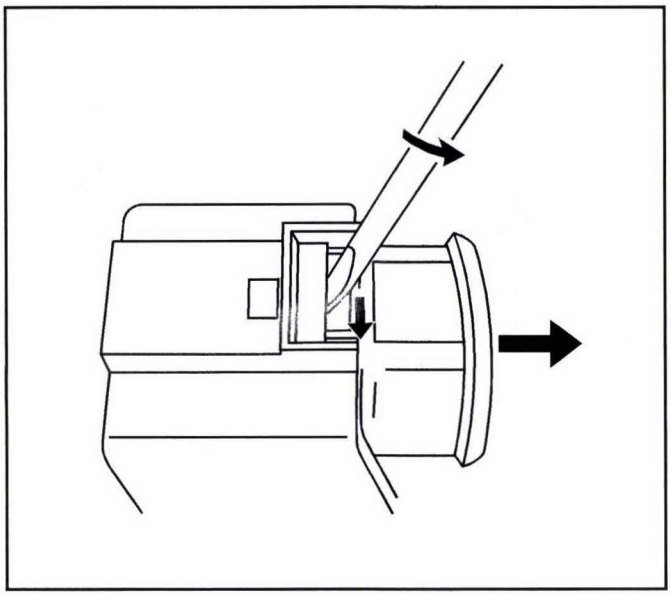
FEP Connectors (Steering Gear)

Removal Procedure



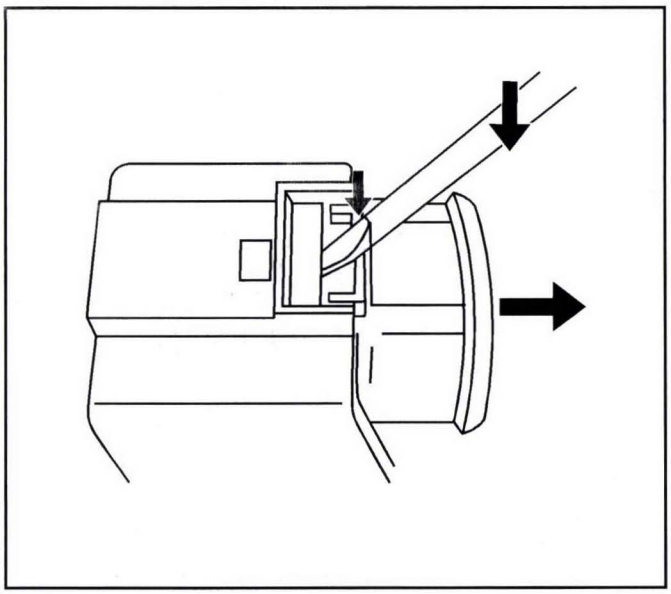
2374629

1. Use a flat-bladed tool to release the locking tab on the connector.



2728308

2. Option 1: Twist the flat-bladed tool to push the top of the locking tab inward while pulling the connector body out.



2728310

3. Option 2: Pry using the flat-bladed tool to depress the locking tab while pulling the connector body out.

JST Connectors

Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-553* Terminal Release Tool

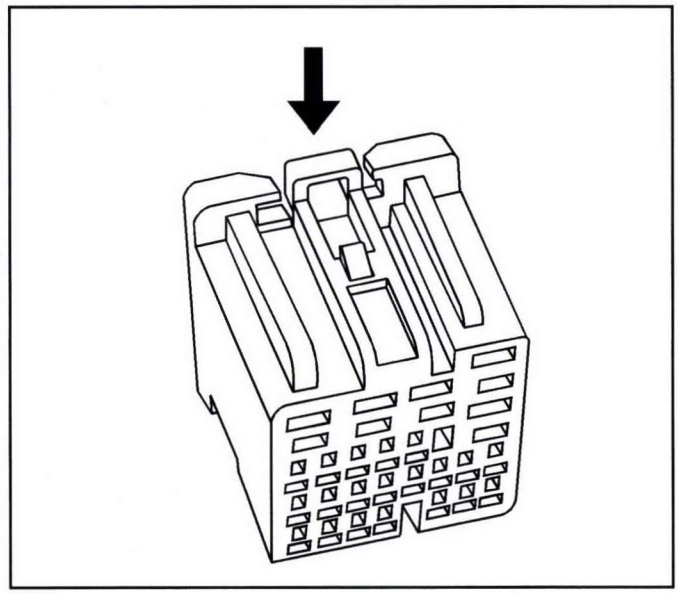
For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure

The JST connector family consists of seven unique connector housings differentiated by color and keying. This connector family is designed to use both 0.64 and 2.8 sized terminals.

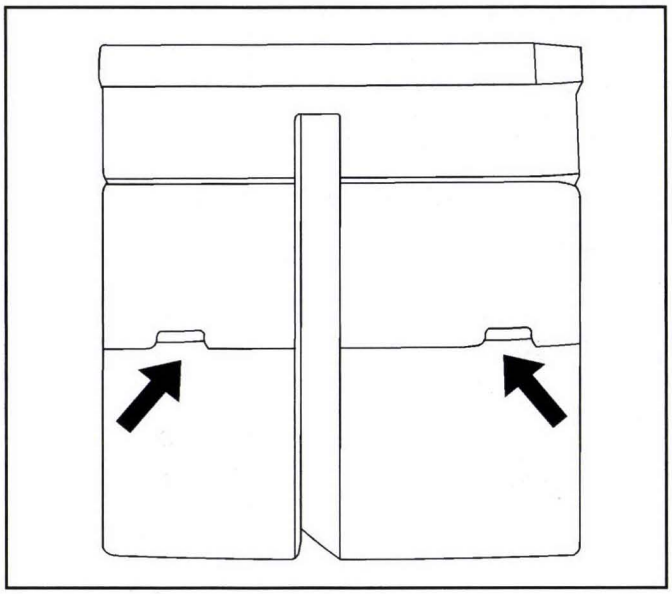
JST BCM Connector

GM Service Part #	Color
88988806	Gray
88988837	Brown
88988838	Lt Green
88988839	Natural
88988840	Lt Blue
88988841	Black
88988842	Pink



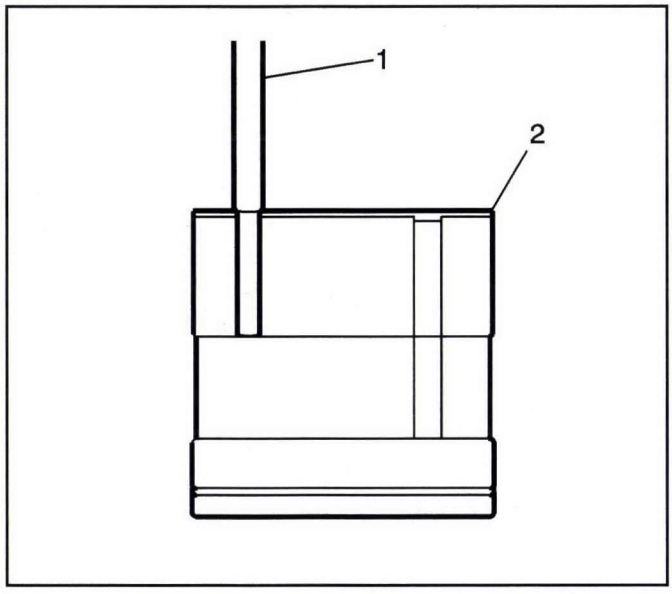
1774096

1. While depressing the lock, remove the connector from the component.



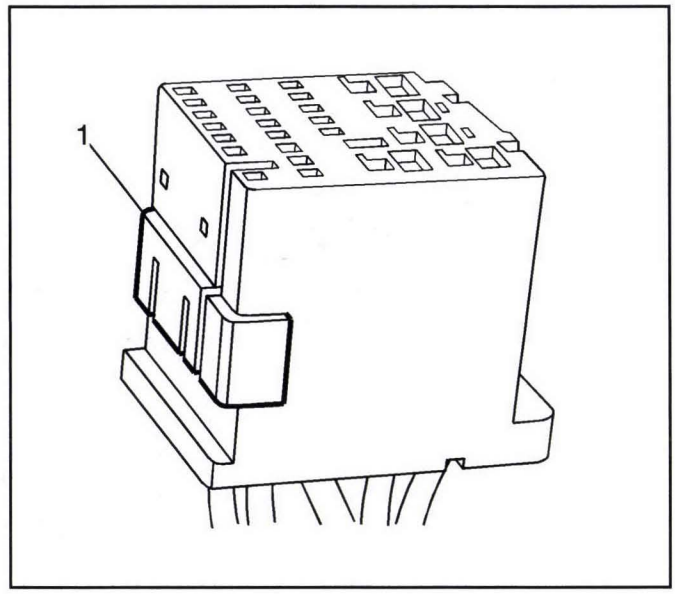
1774100

2. Unlock the terminal position assurance (TPA):
   - Position connector as shown (above) and locate TPA staging cavities.



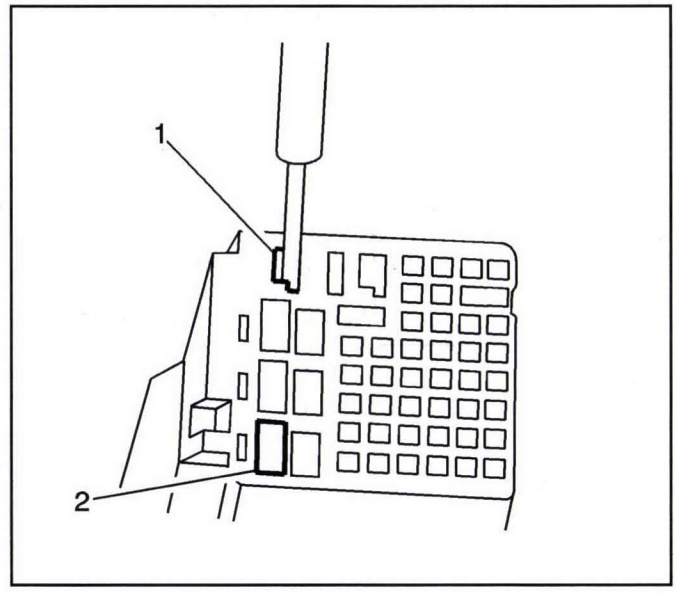
2506090

- Using connector terminal release tool J-38125-553 (1) lift the TPA into the staged position. Perform this step on both sides of the TPA.



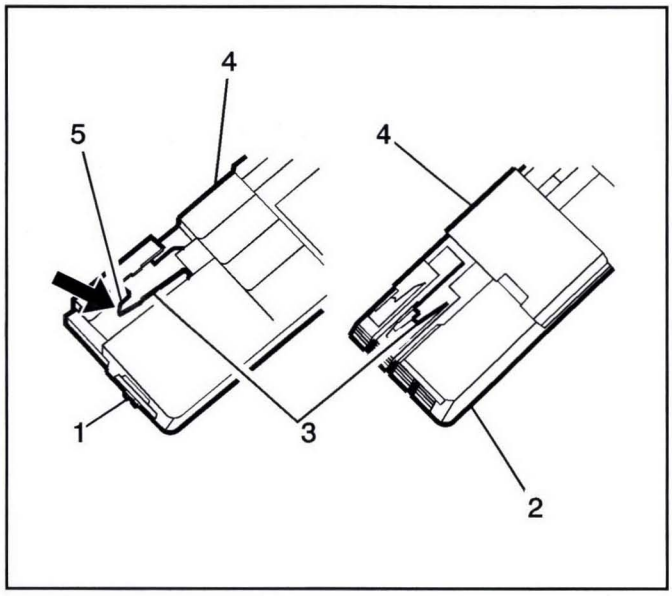
2506084

- You will feel the TPA click into place when fully extended into the staged position. The figure above shows the TPA (1) in the staged position.



2506091

3. Release the terminal from the connector:
   - Position the connector as shown (above) and locate the terminal release entry canal (1) of the suspect terminal.
   - Insert the connector terminal release tool J-38125-553 into the entry canal with the angled side of the tool facing the connector wall containing cavity 4 (2).



2506092

- The cavity on the left (1) is a 2.8 mm² cavity and the cavity on the right (2) is a 0.64 mm² cavity.
- Place the tip of the connector terminal release tool onto the connector lance (3) and deflect the lance to the right (5) to release the lock. Hold this released position.
- Holding the lance in the released position, slightly pull on the suspect terminal to remove it from the connector housing. The side TPA (4) is a secondary lock.

4. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
5. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

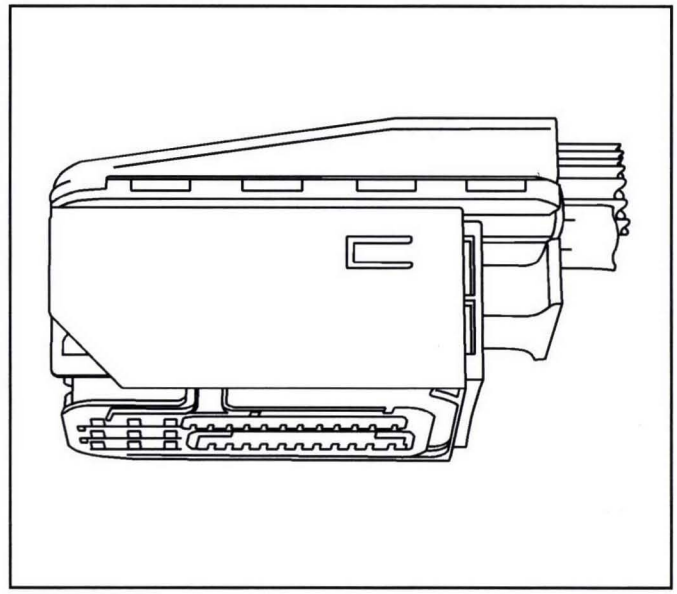
Kostal Connectors (Glow Plug Control Module)

Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-24* Terminal Release Tool
- *J-38125-560* Terminal Release Tool

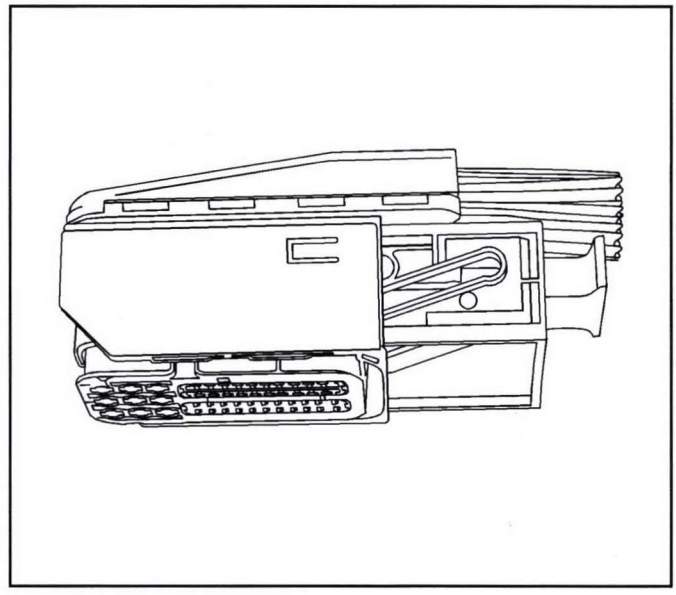
For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure



1709300

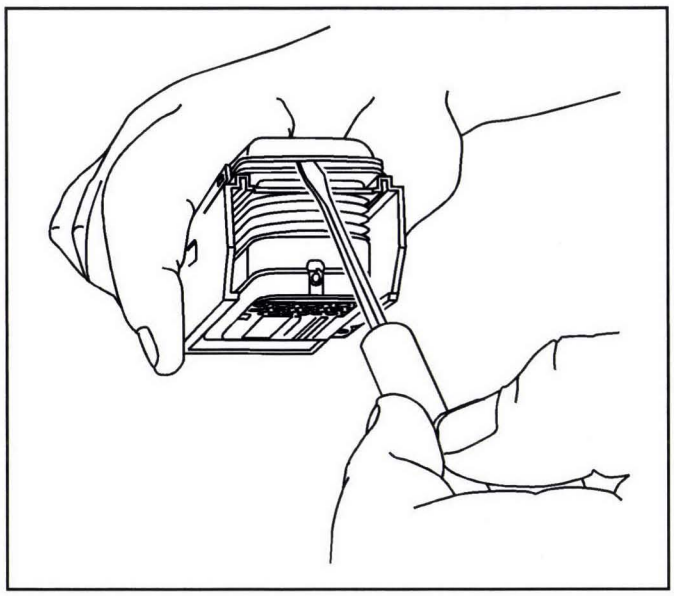
View of typical connector.



1709301

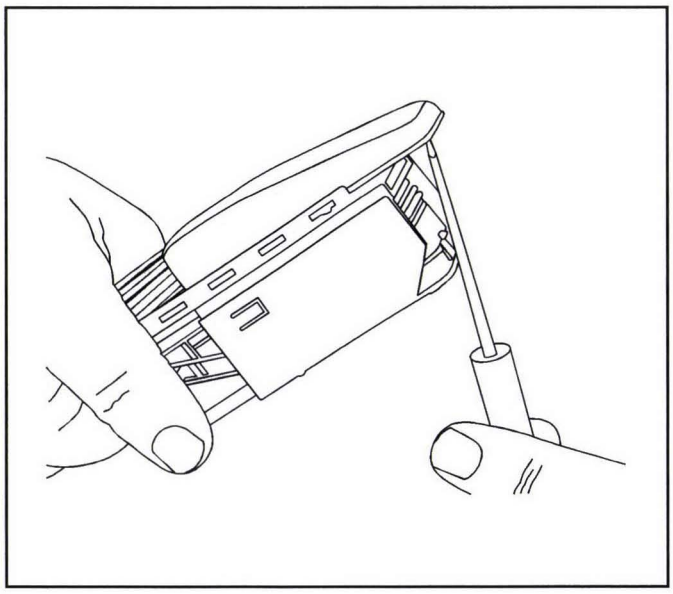
View of connector in released position.

1. Locate the assist lever at the back of the connector. Move the assist lever to the rear position.
2. Disconnect the connector from the component.



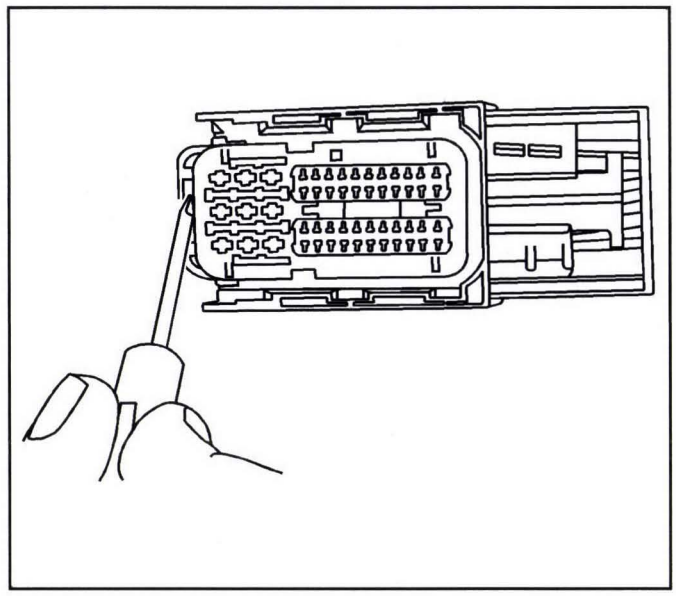
1709302

3. Use a small flat-blade tool to remove the dress cover.



1709303

4. Slide the dress cover forward and off of the connector.

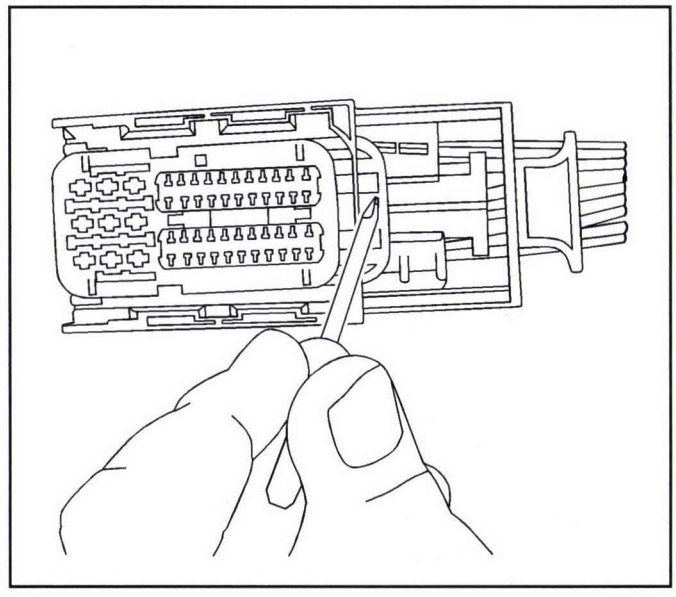


1709304

5. The terminal positive assurance (TPA) is located in the front and rear of the connector.

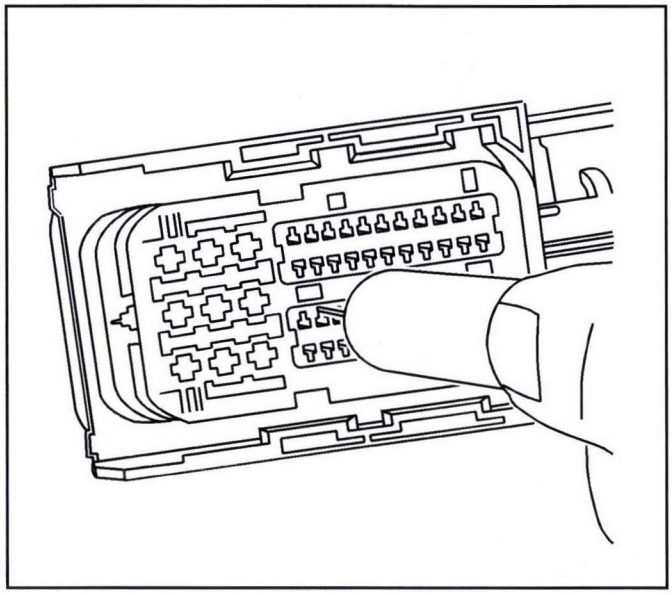
   Note: The front TPA cannot be removed from the connector. Only move it to the preset position.

6. Use a small flat-blade tool to move the front TPA to the preset position, outboard approximately 0.125 in. (3 mm).



1709305

7. Use a small flat-blade tool to completely remove the rear TPA from the connector.



1709306

8. Use the J-38125-24 or the J-38125-560 tool to release the terminals by inserting the tool into the terminal release cavity.
9. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
10. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.

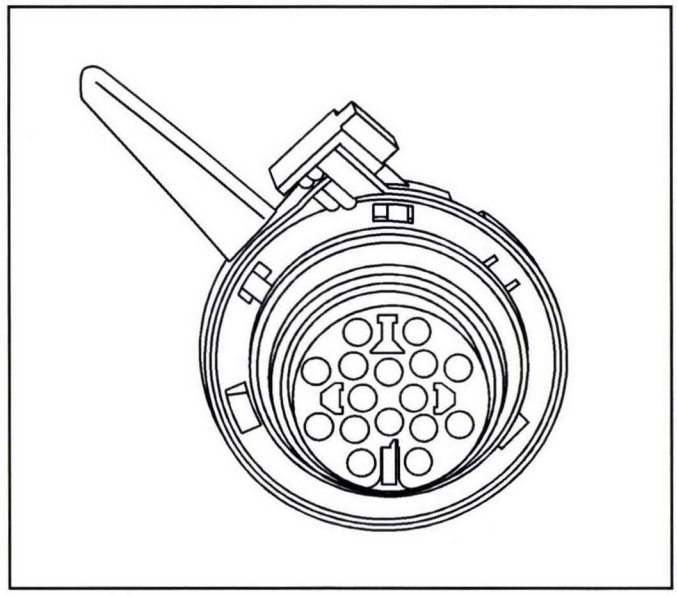
Kostal Connectors (Transmission)

Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-28* Terminal Release Tool

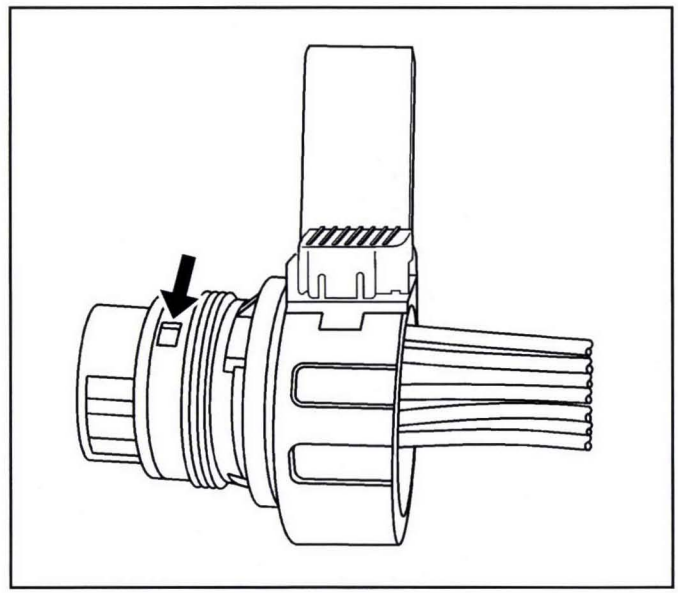
For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure



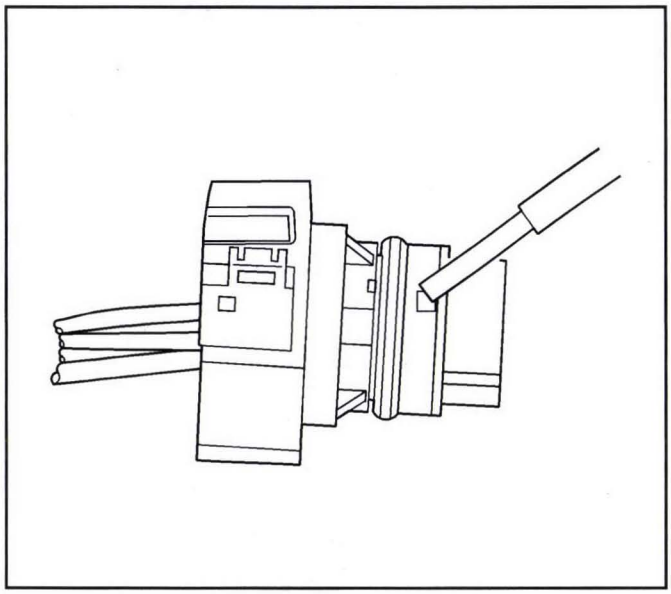
1921876

1. While depressing the lock, twist and remove the connector from the component.



1921872

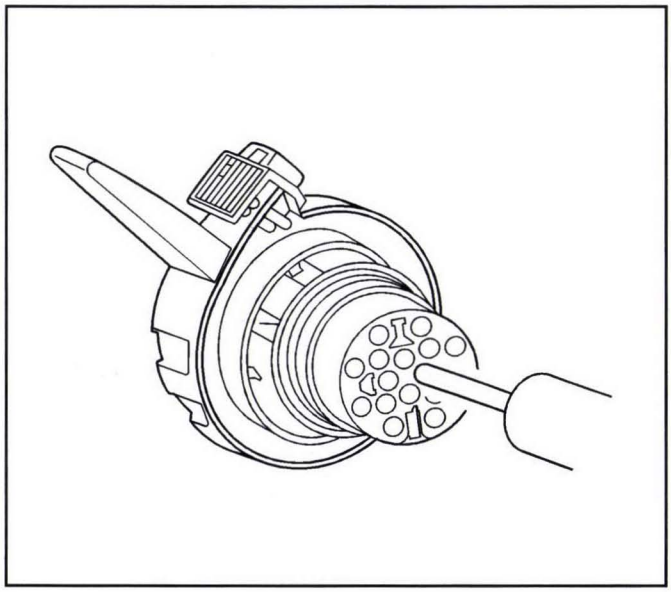
2. Locate the terminal position assurance (TPA).



1921873

Note: The TPA cannot be removed from the connector while there are terminals present in the connector body.

3. Use a small flat-blade tool to push the TPA until it bottoms out.



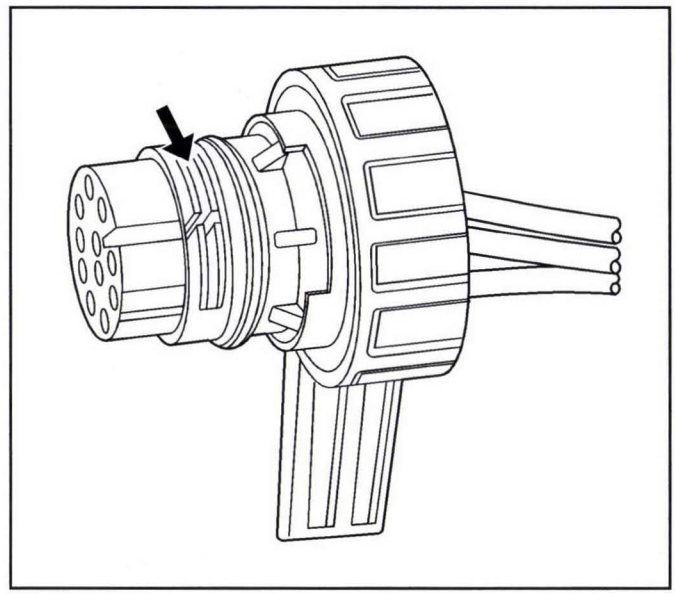
1921843

4. Use the J-38125-28 tool to release the terminals by inserting the tool into the terminal cavity as shown in the graphic.
5. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
6. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.

Terminal Insertion Procedure

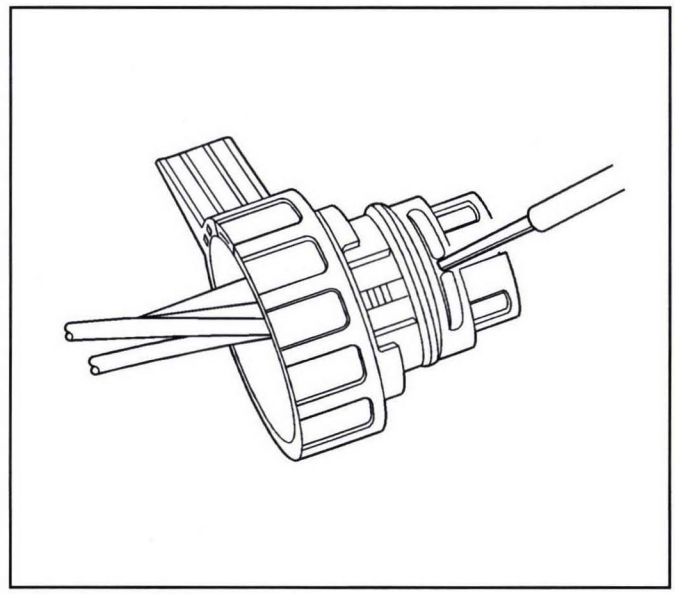
After the terminal is replaced, perform the following procedure in order to insert the terminal.

1. Slide the new terminal into the correct cavity at the back of the connector.
2. Push the terminal into the connector until it locks into place. The new terminal should be even with the other terminals. Ensure that the terminal is locked in place by gently pulling on the wire.



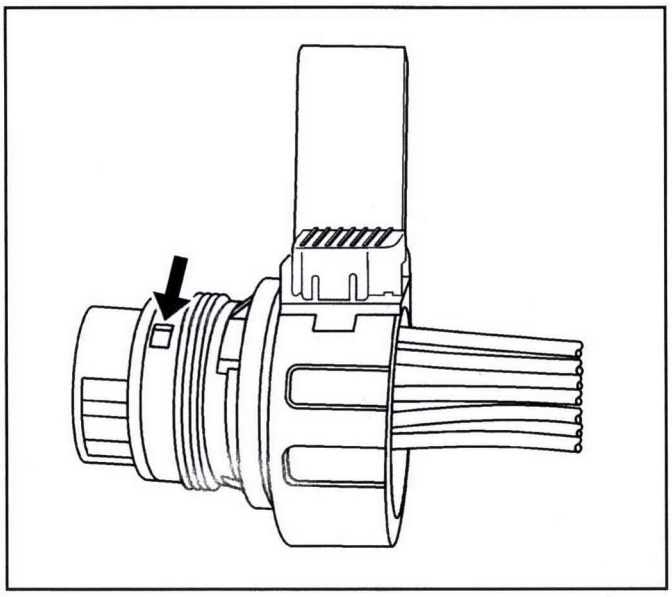
1921848

3. Locate the TPA.



1921849

4. Use a small flat-blade tool to push the TPA until it bottoms out.



1921872

5. Ensure the TPA is fully seated. The TPA should be centered and flush with the connector body when viewed.

Molex Connectors

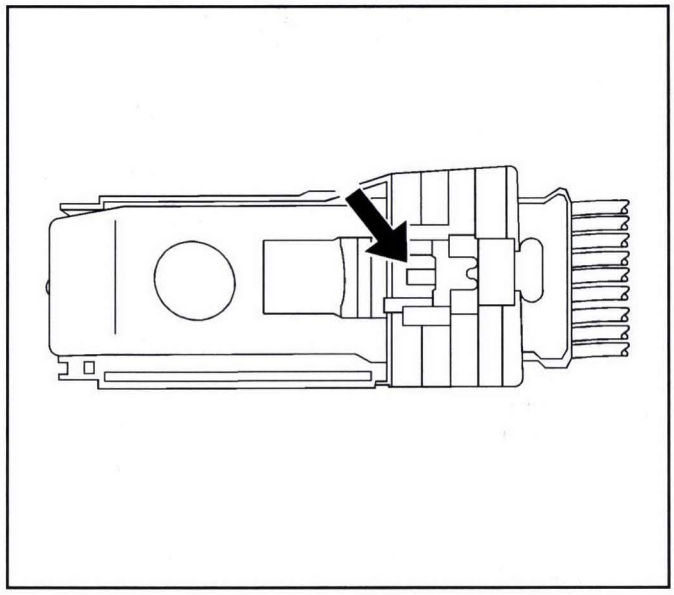
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-213* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

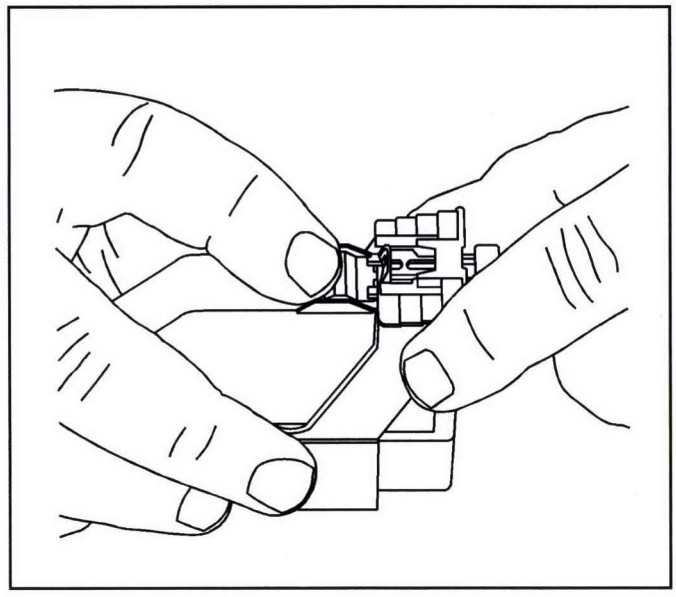
Terminal Removal Procedure

1. Locate the connector position assurance (CPA) on the top of the wire dress cover. Slide the CPA forward.



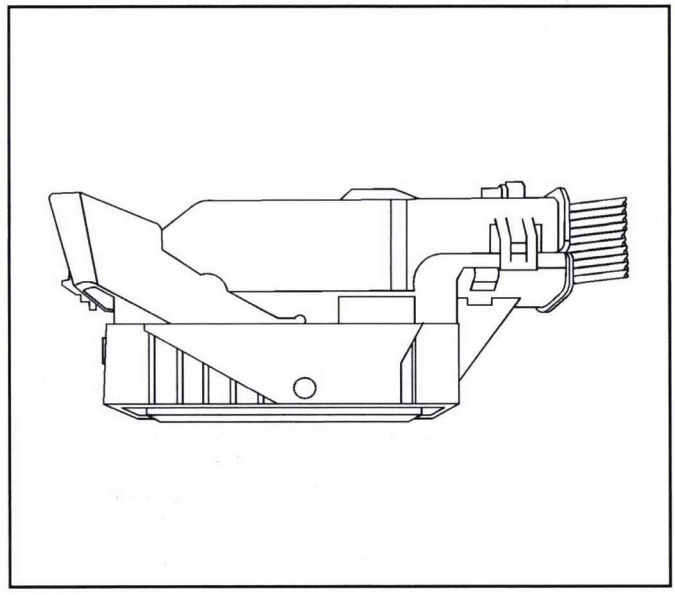
1709320

2. Slide the lever lock forward while pressing down on the lever lock release tab.



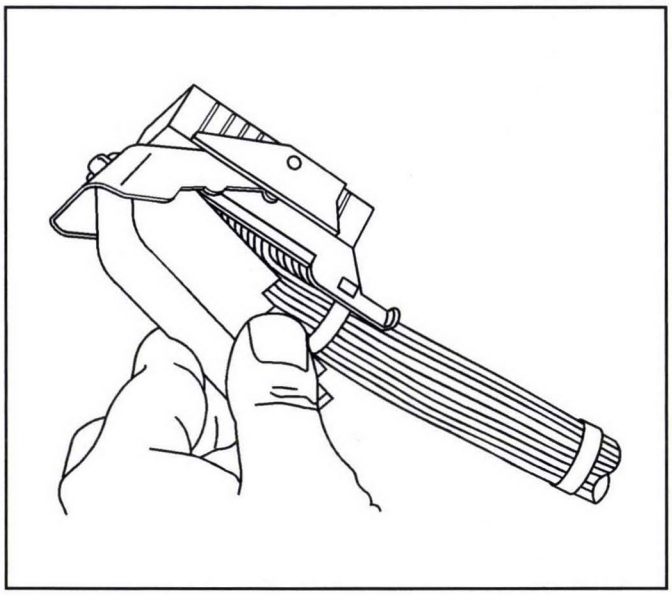
1709258

3. The lever should be in the full forward position.



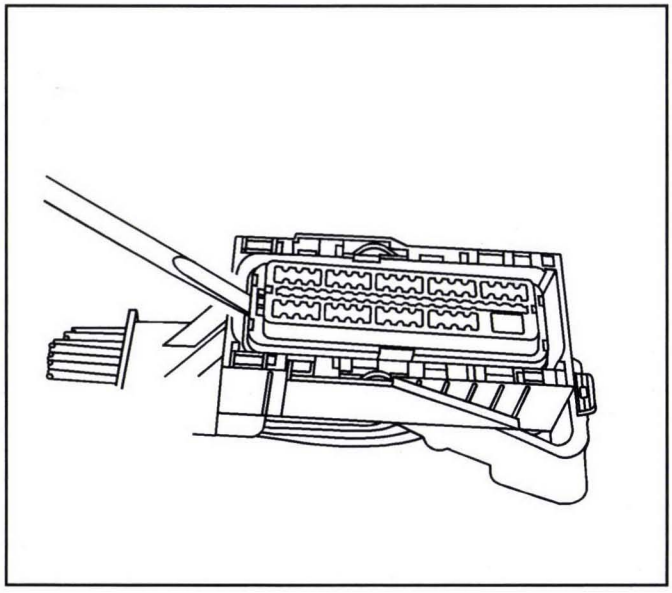
1709322

4. Disconnect the connector from the component.



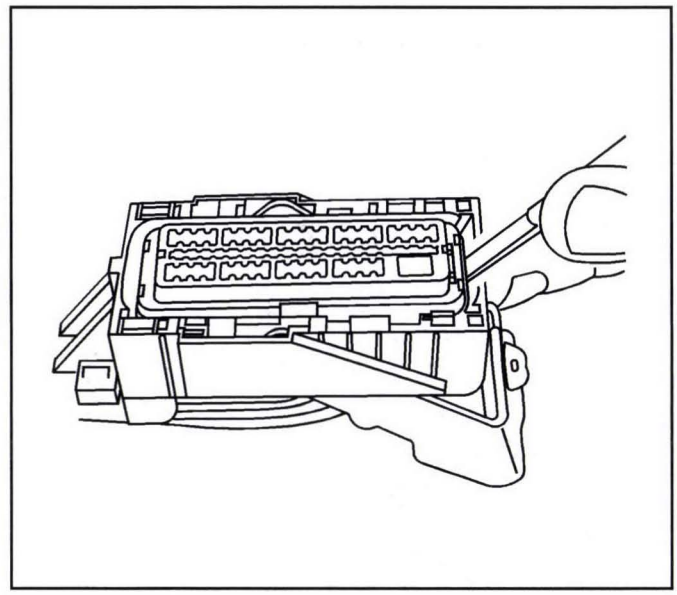
1572878

5. Remove the dress cover by using a flat bladed tool to release the dress cover locking tabs and lift up on the dress cover.
6. Cut the tie wrap that holds the wires to the connector body.



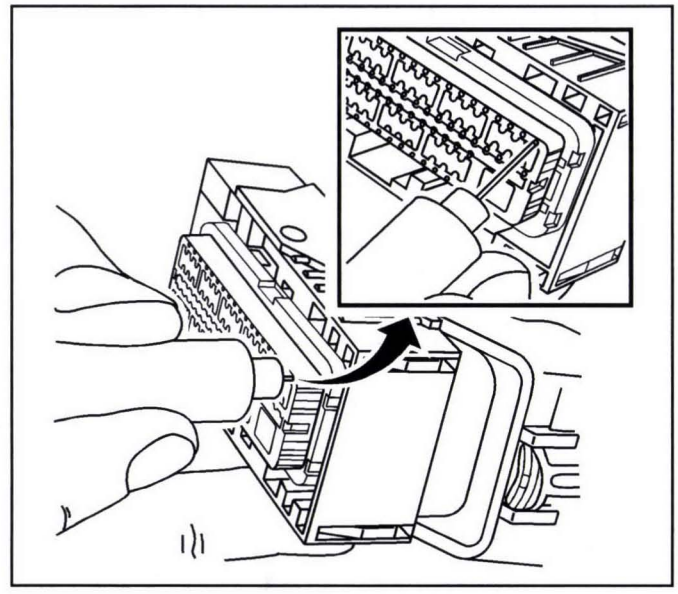
1572905

7. Use a small flat-blade tool to pry one side of the nose piece up to the pre-stage position. When the nose piece is in the pre-staged position, the nose piece will be raised above the connector body the length of the step in the nose piece.



1572908

8. Use a small flat-blade tool to pry the other side of the piece to the pre-stage position. If the nose piece is higher than the first step in the nose piece, gently push down on the nose piece until it meets with resistance from the connector body, you should feel the nose piece click into position.



1572911

9. Insert the J-38125-213 into the small terminal release hole on the nose piece and gently pull on the back of the wire.
10. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
11. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Terminated Lead Repair

1. Remove the terminal.
2. Find the appropriate terminated lead.
3. Use the appropriate splice sleeves depending on the gauge size.
4. Refer to *Splicing Copper Wire Using Splice Sleeves on page 11-890*.

Terminal Insertion Procedure

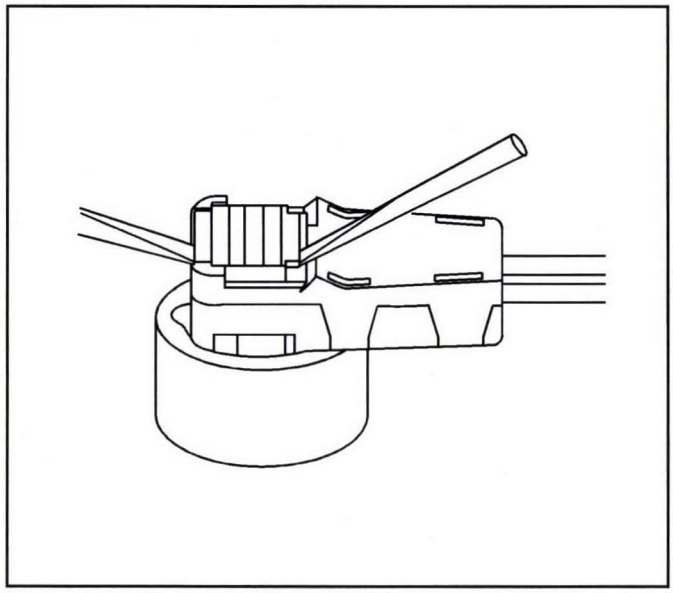
After the terminal is replaced, perform the following procedure in order to insert the terminal.

1. Slide the new terminal into the correct cavity at the back of the connector.
2. Push the terminal into the connector until it locks into place. The new terminal should be even with the other terminals. Insure that the terminal is locked in place by gently pulling on the wire.
3. To assemble the connector, reverse the connector disassembly procedure.

Molex Connectors (SIR)

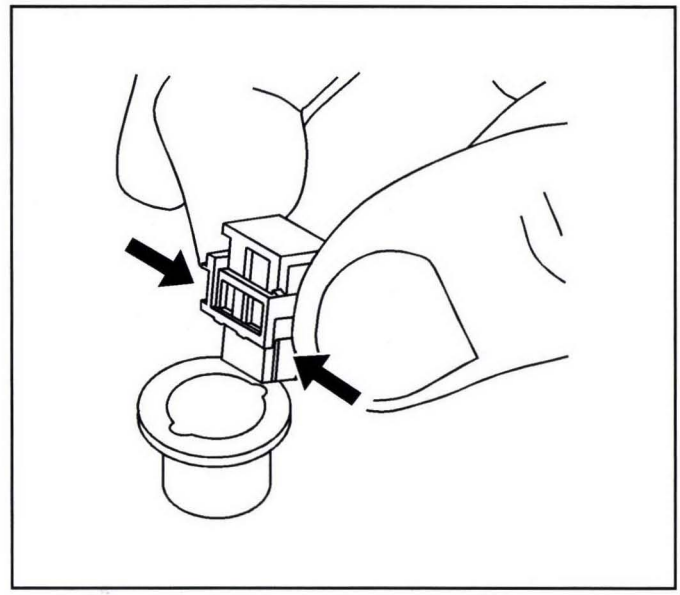
Removal Procedure

Note: The orange or yellow connector position assurance (CPA) must be released first to disconnect or to connect the connector.



2374625

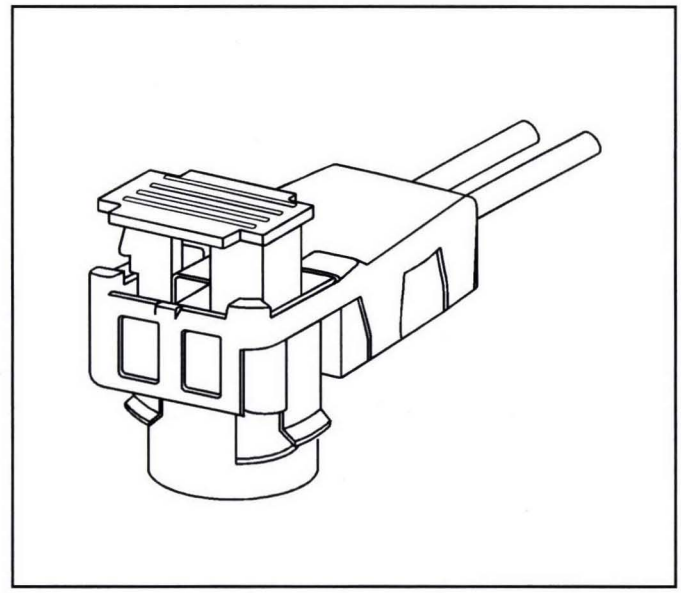
1. Lift the orange or yellow CPA vertically (avoid lifting on an angle to the connector) approximately 4 mm to release the connector. Use a small flat-bladed tool to help release the CPA. The CPA may also be released manually without any tools.



3258545

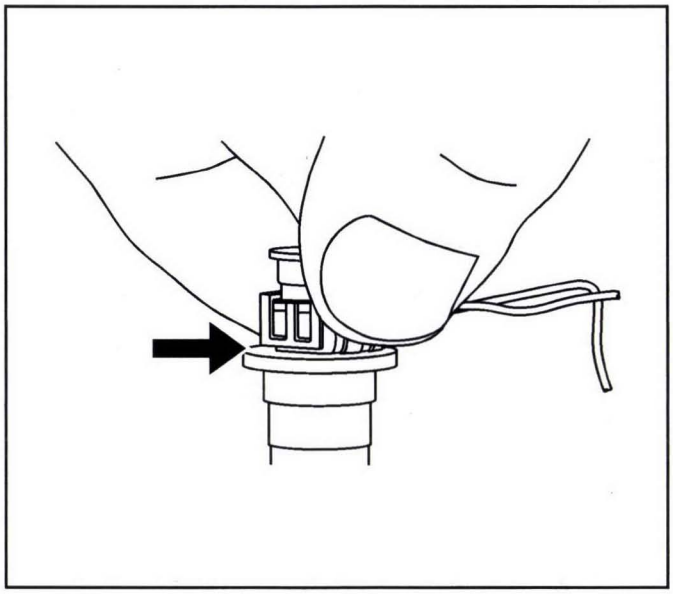
2. Grab the connector on both sides and lift vertically to disconnect the connector.

Installation Procedure



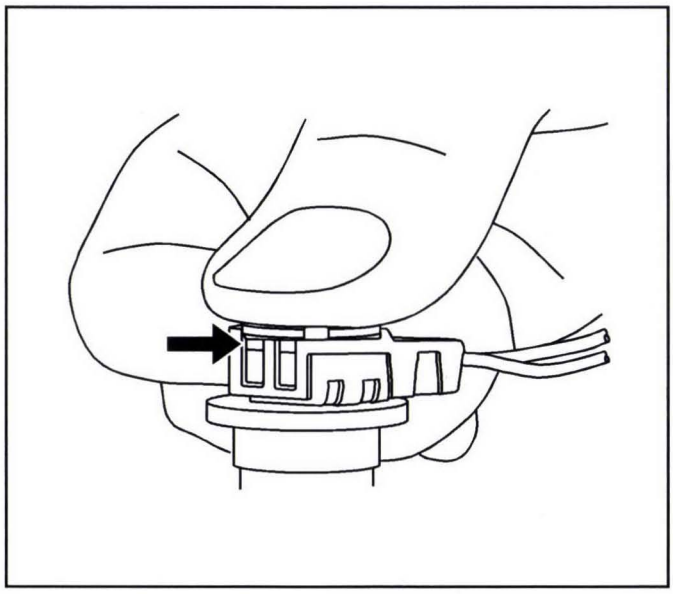
2374626

1. The CPA should be approximately 4 mm above the yellow cover before installing the connector. If not, use a small flat-bladed tool to help release the CPA. The CPA may also be released manually without any tools.



3258546

2. Line up the connector key tabs with the initiator key slots. Grab the connector on both sides and push down into the initiator connector sub assembly until fully seated.



3258548

3. After the connector is fully seated, push the CPA down with your thumb until the CPA is touching the yellow cover on the connector.

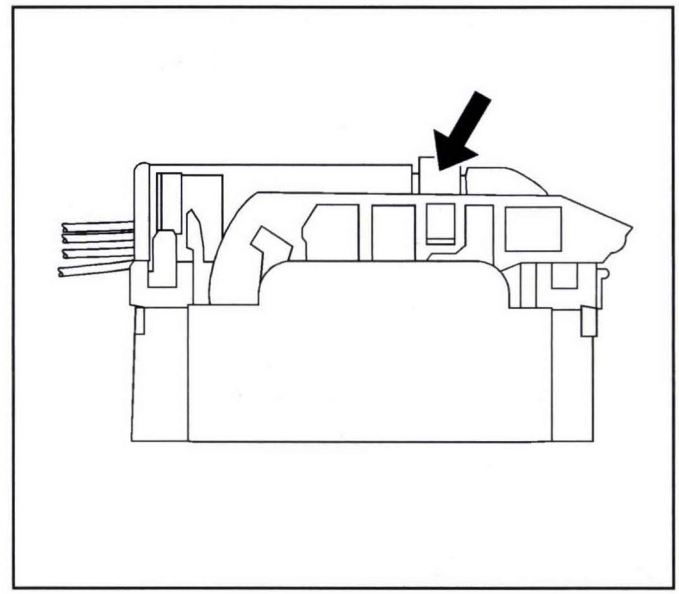
Sumitomo Connectors

Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-12A* Terminal Release Tool
- *J-38125-552* Terminal Release Tool
- *J-38125-553* Terminal Release Tool

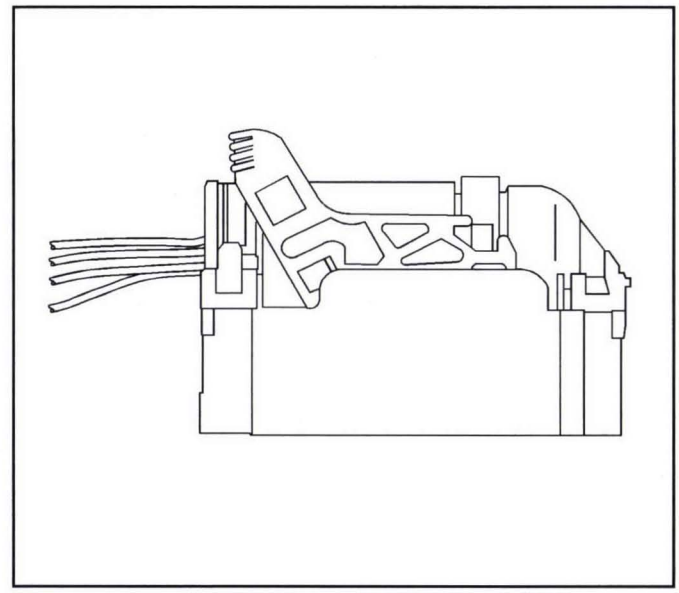
For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure



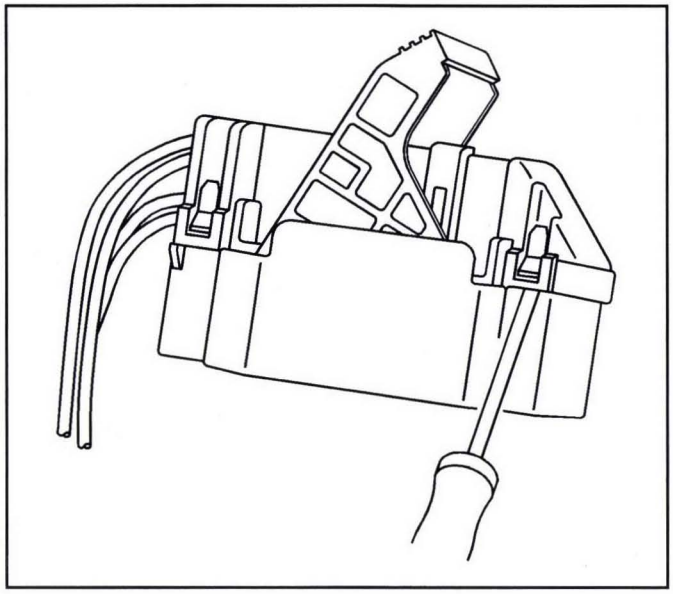
1709317

1. Slide the lever lock forward while pressing down on the lever lock release tab.



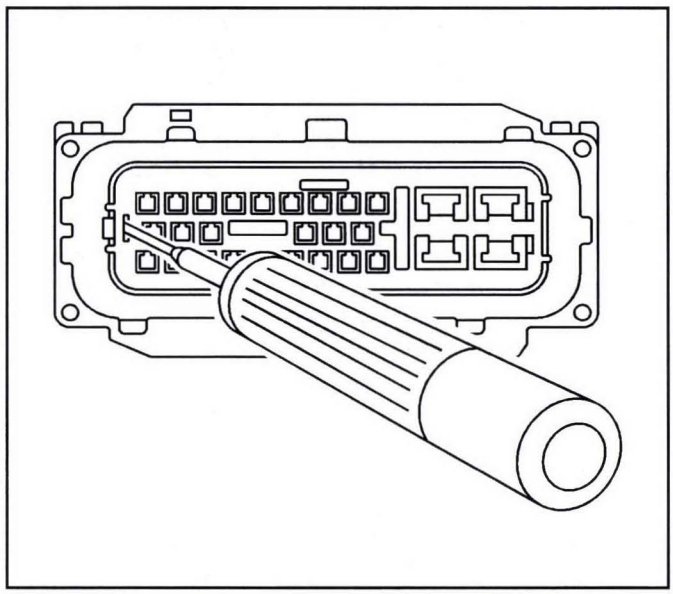
1709319

2. Disconnect the connector from the component.



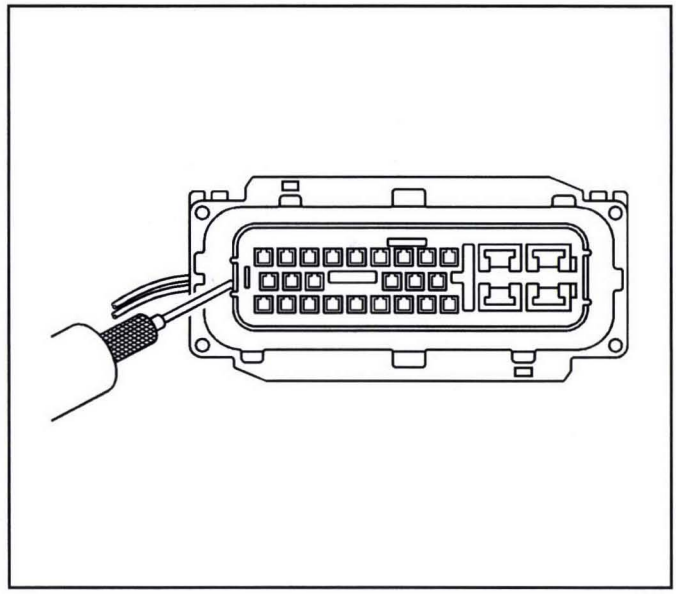
1574033

3. Remove the dress cover by using a flat-blade tool to release the connector locking tabs and pulling off the dress cover.



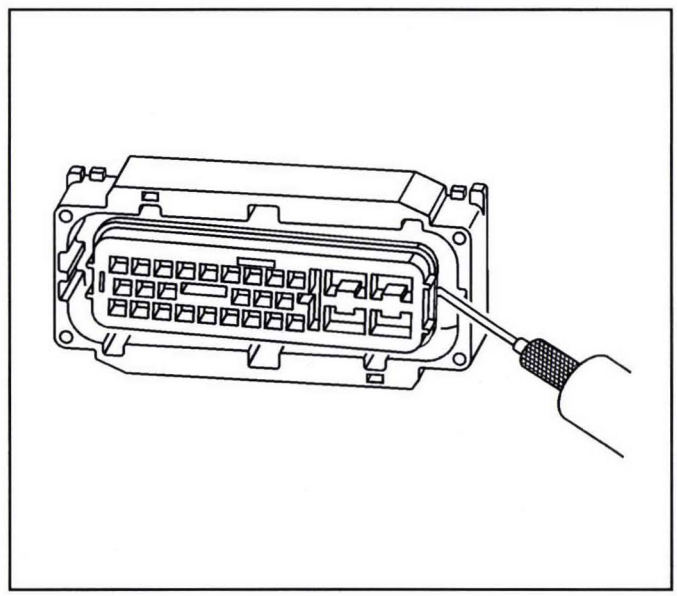
1574069

4. Relieve the tension on the nose piece retainers by inserting J-38125-12A into the single retainer slot on the end of the nose piece and gently prying out the locking tab. Repeat the process for both of the nose piece locking tabs on the opposite side of the nose piece.



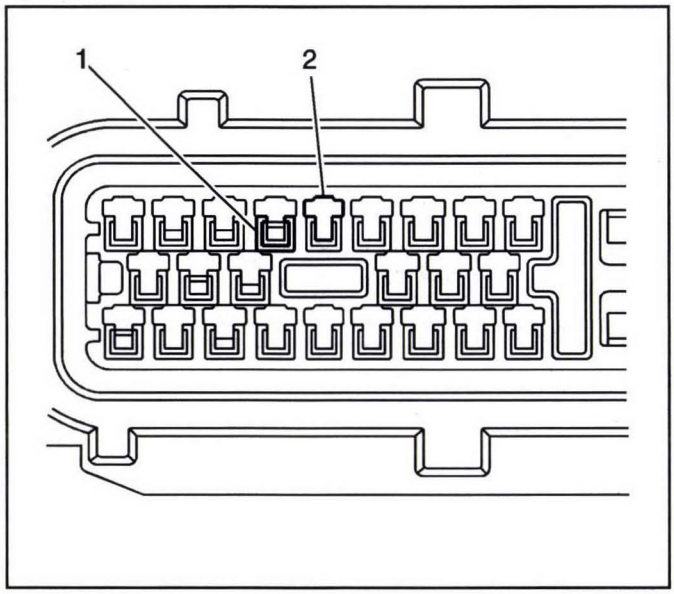
1574058

5. Once the nose piece retainers are relaxed, use the J-38125-552 to pull up the nose piece by hooking the tool under the nose piece and pulling up. The nose piece should raise slightly.



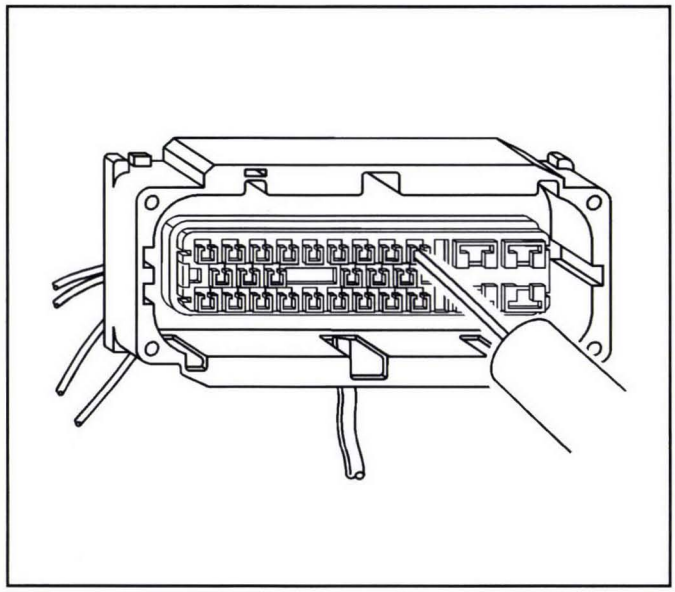
1574184

6. On the opposite side of the nose piece, use the J-38125-552 pull up the nose piece by hooking the tool under the nose piece and pulling up. The nose piece should release completely. If the nose piece does not come off, repeat the procedure on the opposite side.



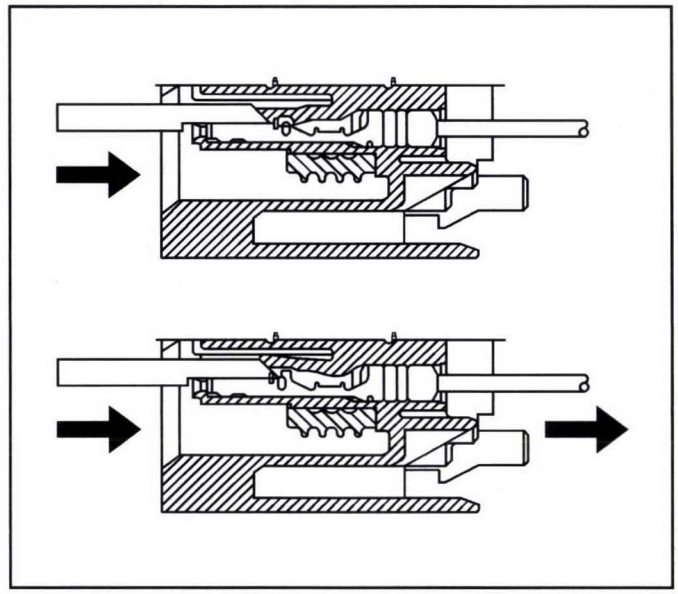
1574213

7. The illustration above identifies the entry canal where the terminal release tool will be inserted, and the terminal cavity.
   - Terminal (1)
   - Entry Canal (2)



1574218

8. Insert the J-38125-553 tool into the entry canal and pry up on the terminal retainer. The terminal retainer is a small plastic piece on the top of the terminal. The terminal retainer must be held up while the terminal is pulled out of the connector.



1574534

9. The illustration shows a cutaway view of the connector to aid the technician in releasing the terminal retainer.
10. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
11. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Terminal Insertion Procedure

After the terminal is replaced, perform the following procedure in order to insert the terminal.

1. Slide the new terminal into the correct cavity at the back of the connector.
2. Push the terminal into the connector until it locks into place. The new terminal should be even with the other terminals. Ensure that the terminal is locked in place by gently pulling on the wire.
3. To assemble the connector, reverse the connector disassembly procedure.

Tyco/AMP Connectors (CM 42-Way)

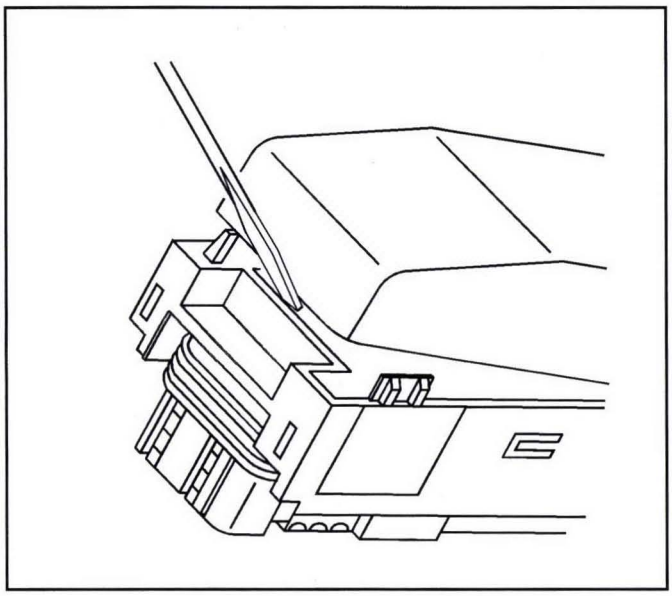
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-12A* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

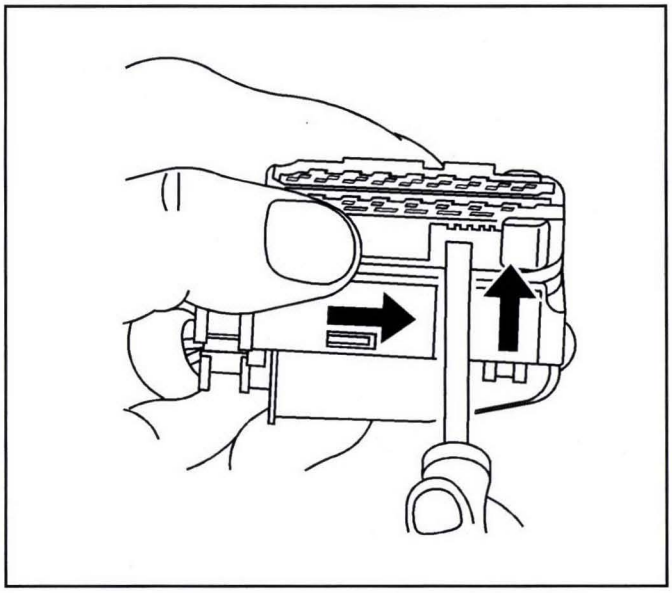
Terminal Removal Procedure

1. Locate the connector position assurance (CPA) on the connector body and pull the CPA out. The CPA is on the wire harness side of connector.
2. Disconnect the connector from the component.



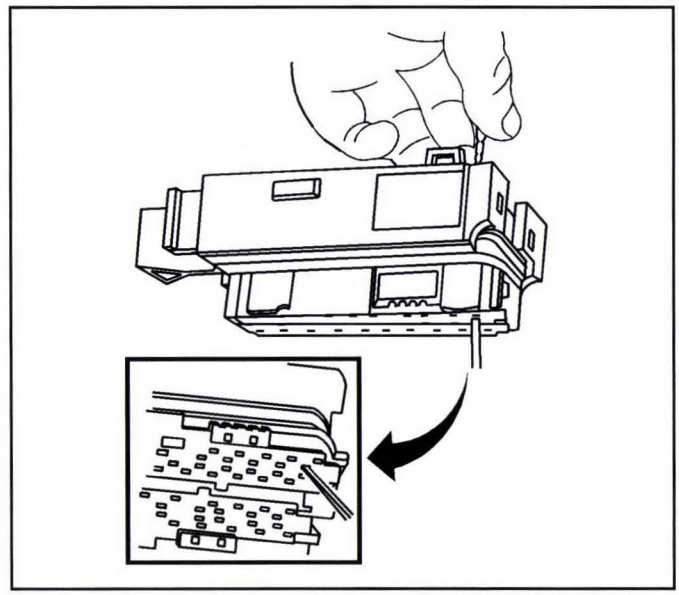
1263409

3. Use a small flat-bladed tool to gently pry off the dress cover by inserting the tool under the cover opposite the harness side and prying up.
4. Remove the cover.



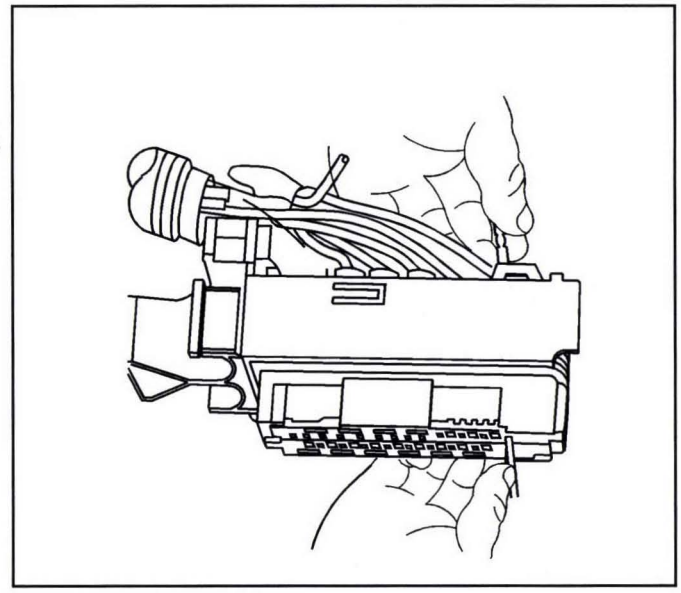
1263511

5. Using a small flat-bladed tool, push on the side of the nose piece retainer while pushing the nose piece forward with your thumb. This will release the terminal position assurance (TPA).



1263568

6. Insert the *J-38125-12A* tool into the corresponding terminal release cavity. The release cavities are the 2 center rows of cavities on one half of the connector.



1263581

7. Pressing the *J-38125-12A* tool in the release cavity of the terminal you are removing, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
8. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
9. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Tyco/AMP Connectors (Sensor)

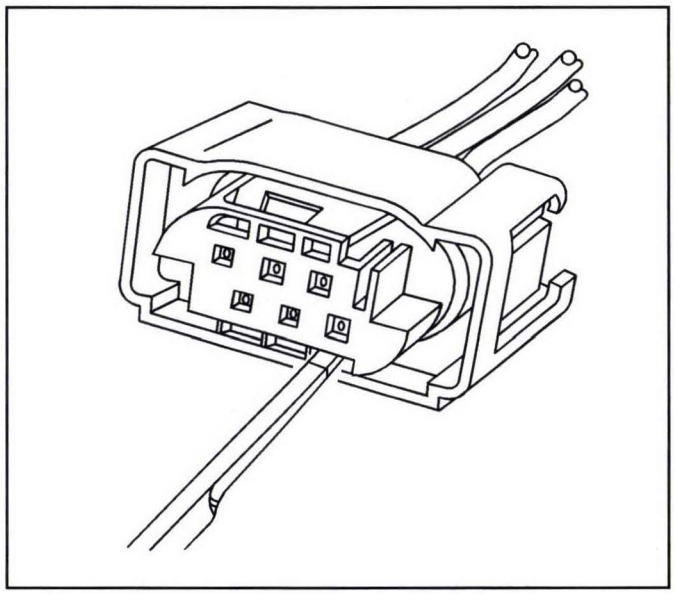
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-11A* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

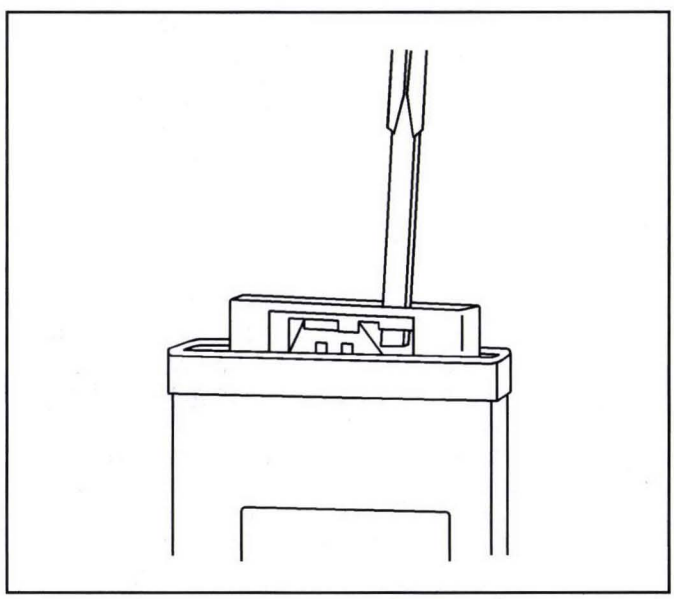
Terminal Removal Procedure

1. Disconnect the connector from the component.



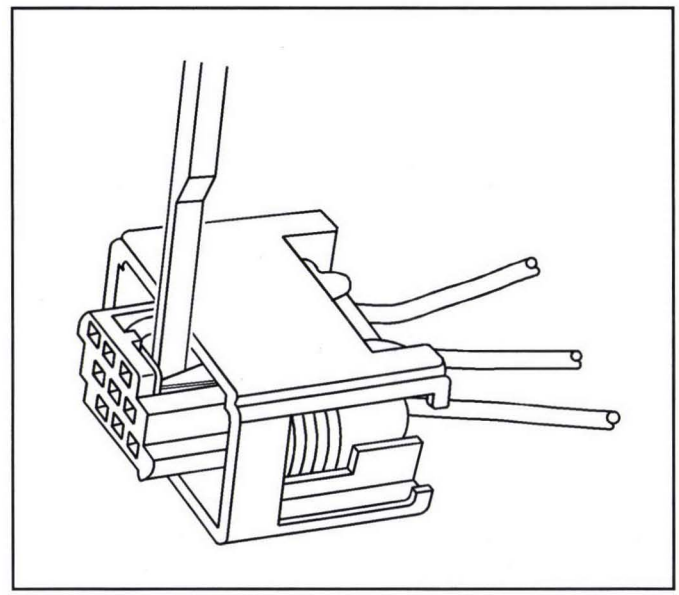
1454796

2. Insert the J-38125-11A tool into the cavity on the lower right hand face of the connector until the terminal release tang access panel slides over.



1454799

3. Ensure that the terminal release tang access panel is in the correct location to access the terminals.
4. Push the wire side of the terminal that is being removed toward the connector and hold it in position.



1454801

5. Insert the J-38125-11A into the terminal release tang access slot located behind the access panel of the connector and press down on the terminal while carefully pulling the terminal out of the connector. Always remember never use force when pulling a terminal out of a connector. If the terminal is difficult to remove, repeat the entire procedure.
6. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
7. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Tyco/AMP Connectors (0.25 Cap)

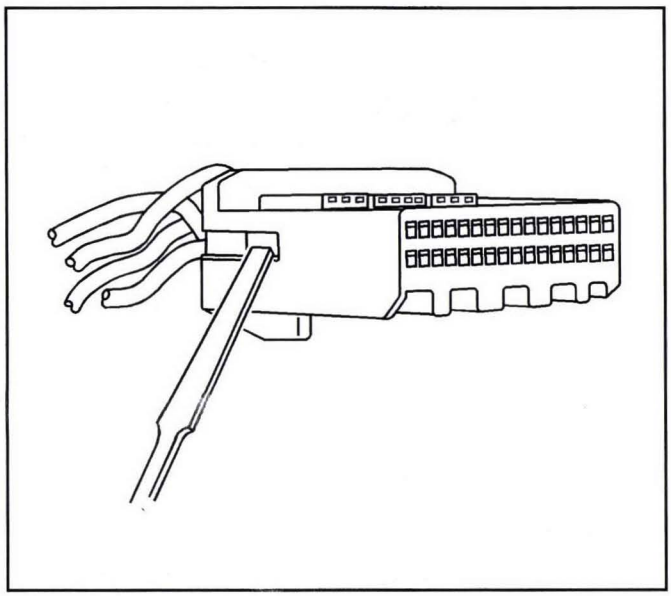
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-24* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure

1. Disconnect the connector from the component by pressing down on the connector position assurance (CPA).

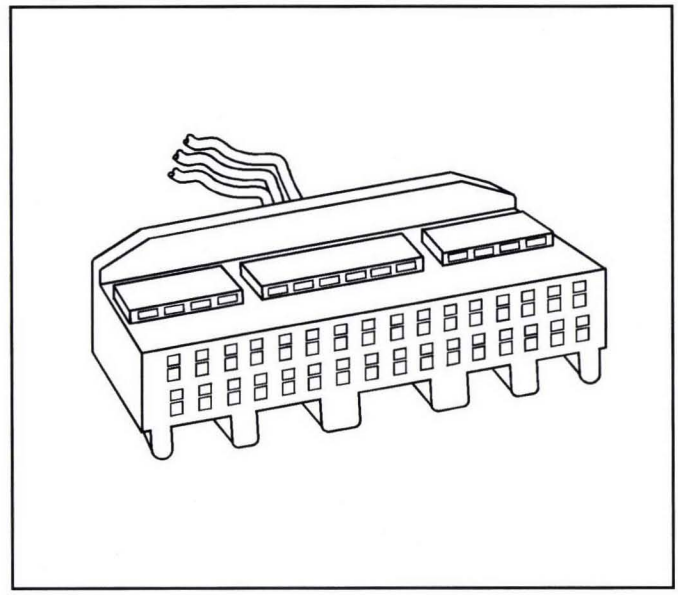


1459859

2. Use a small flat-bladed tool to release the terminal position assurance (TPA) by inserting the tool in the small recess on the side of the connector and pushing up until the TPA releases from the connector body. The TPA should raise just slightly. Do not try to remove the TPA.

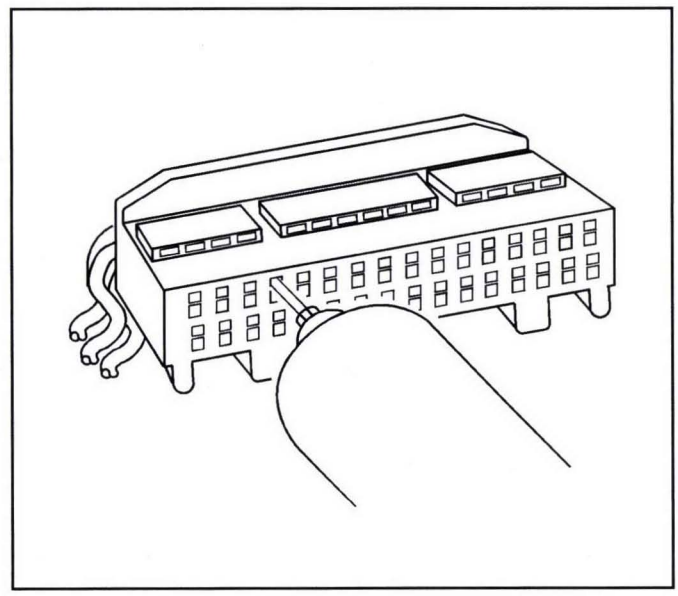
   Note: The TPA on this connector cannot be removed unless the terminals are removed first. The TPA will come out of the connector body, but only slightly. When the TPA is slightly raised the terminals can be removed. Using excessive force to remove the TPA with the terminals still in the connector will damage the connector.

3. Repeat the process for the other side of the connector.



1459860

4. Ensure that the TPA is in the proper position to remove the terminals.



1459861

5. While pushing the terminal forward, insert the J-38125-24 in the release cavity above the terminal you are removing, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
6. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
7. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Tyco/AMP Connectors (43-Way)

Special Tools

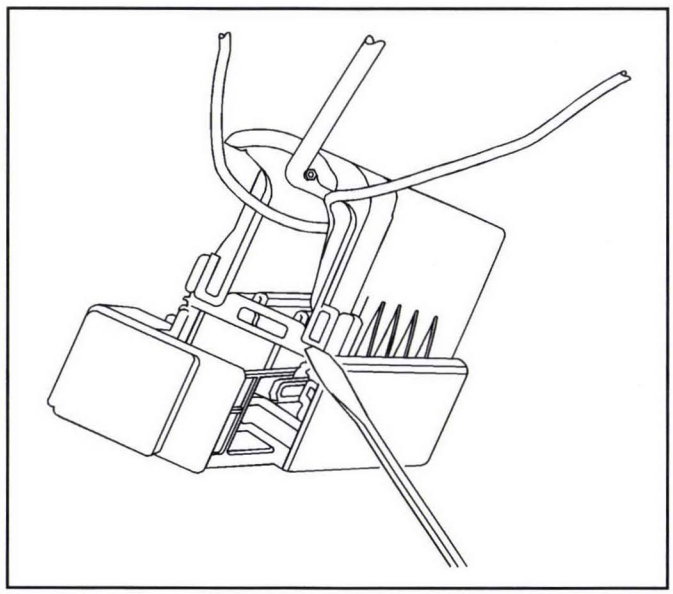
- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-12A* Terminal Release Tool
- *J-38125-13A* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure

Follow the steps below in order to remove terminals from the connector.

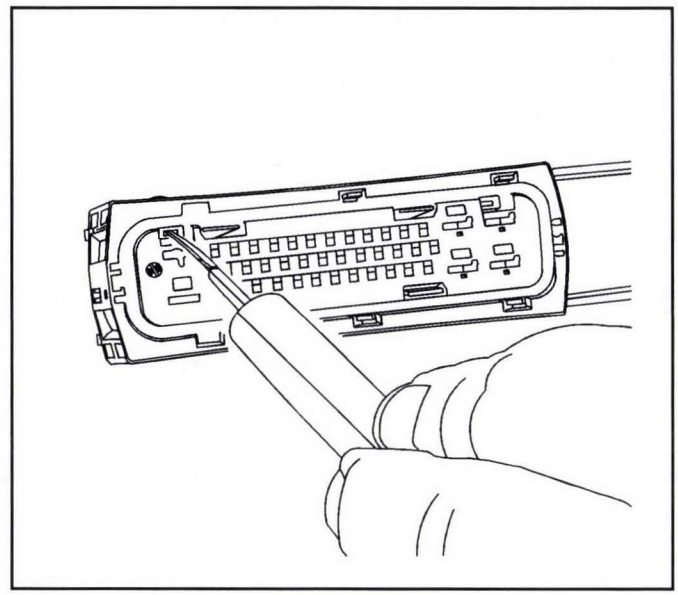
1. Locate the lever lock on the wire dress cover. Slide the lever lock away from the connector body.
2. Disconnect the connector from the component.
3. Locate the dress cover locking tabs on the dress cover of the connector. Using a small flat-bladed tool release all of the locking tabs.
4. Once the locks are unlocked, lift the dress cover off.



1709323

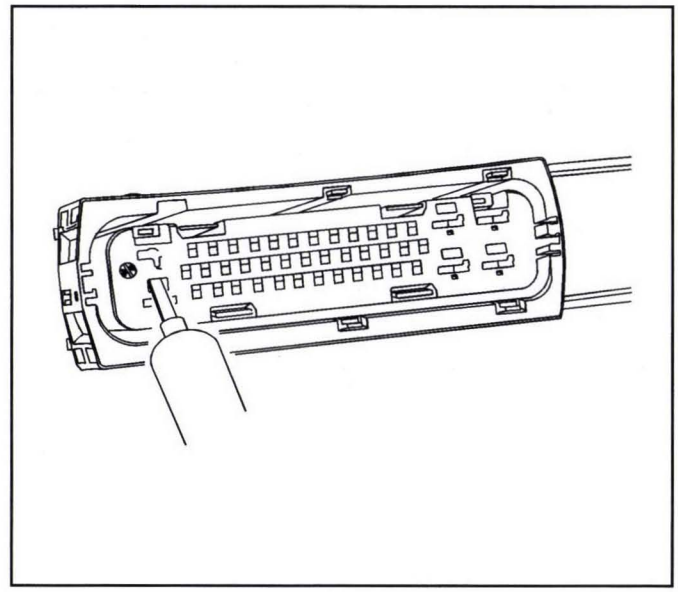
Note: Always use care when removing a terminal position assurance (TPA) in order to avoid damaging it.

5. Release the TPA by inserting a small flat-bladed tool into the blue locking tabs on both ends of the connector. Gently slide the TPA up to the released position on both ends.



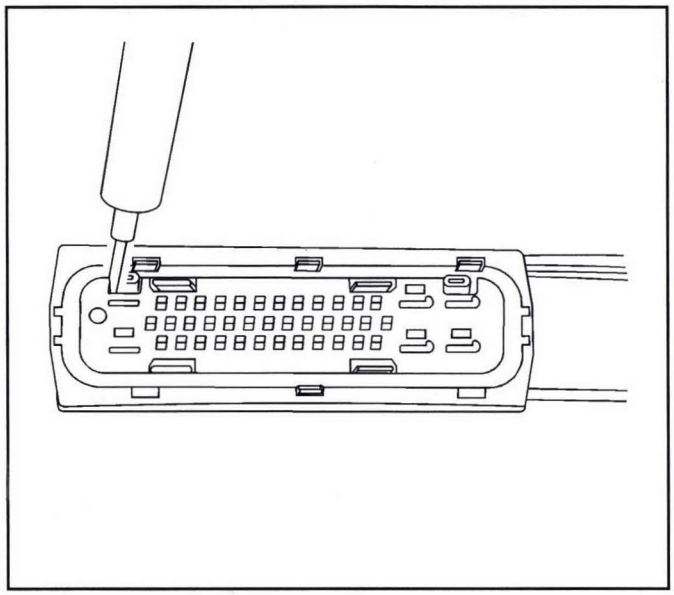
1709325

6. For the larger terminals insert the *J-38125-13A* tool to release the terminals by inserting the tool into the terminal release cavity. For the smaller terminals insert the *J-38125-12A* tool to release the terminals by inserting the tool into the terminal release cavity.



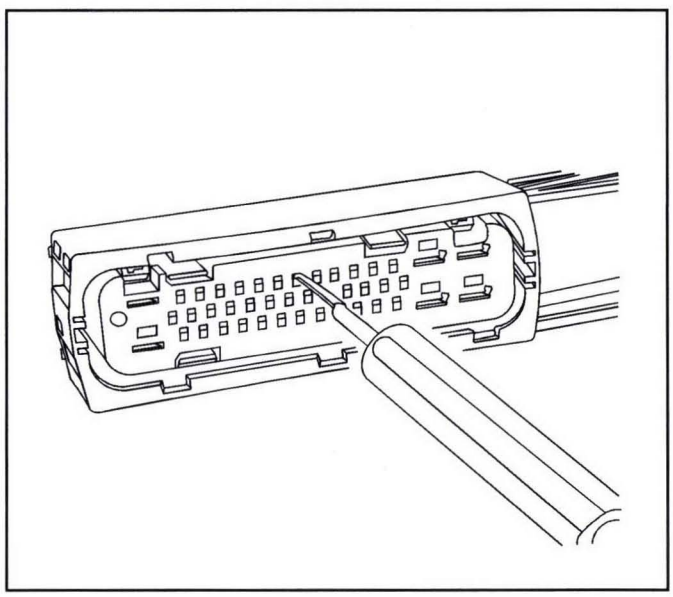
1709326

View of the release tool being used for the larger terminals.



1709327

View of the release tool being used for the larger terminals.



1709328

View of the release tool being used for the smaller terminals.

7. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
8. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
9. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

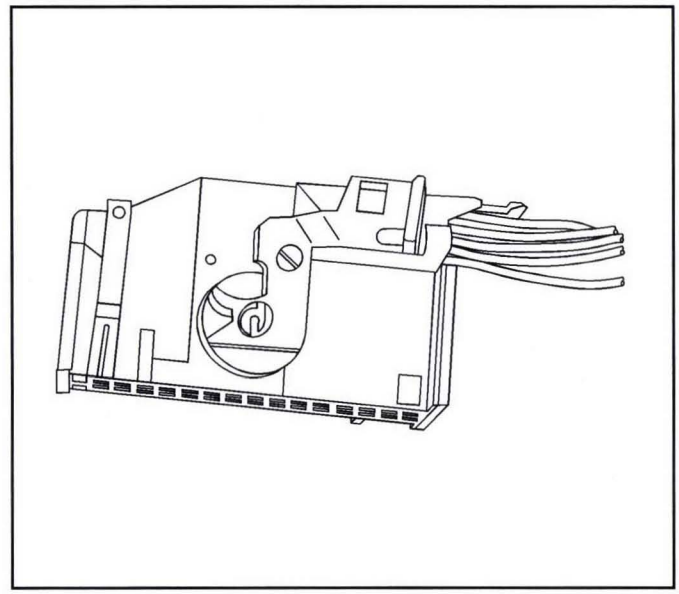
Tyco/AMP Connectors (Door Module)

Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-12A* Terminal Release Tool

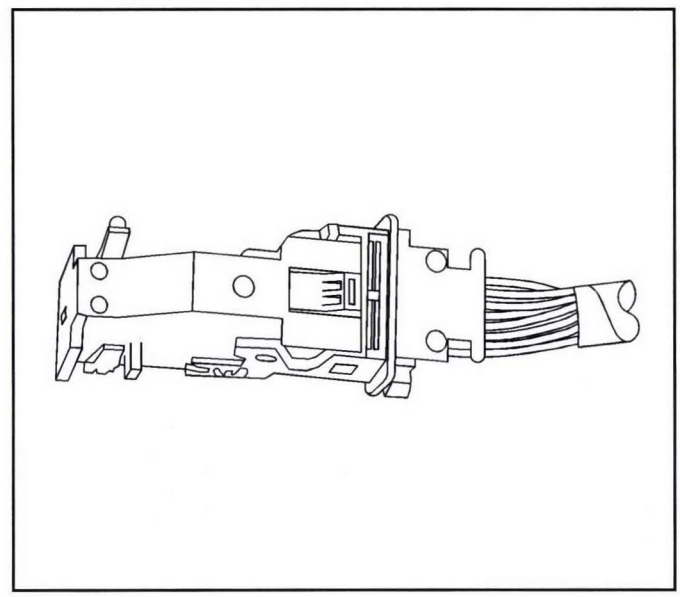
For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure



1709293

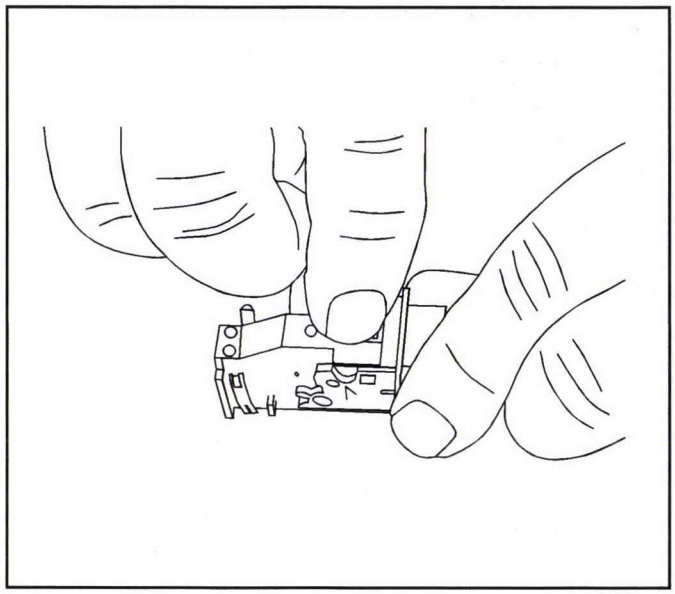
Side view of connector.



1709294

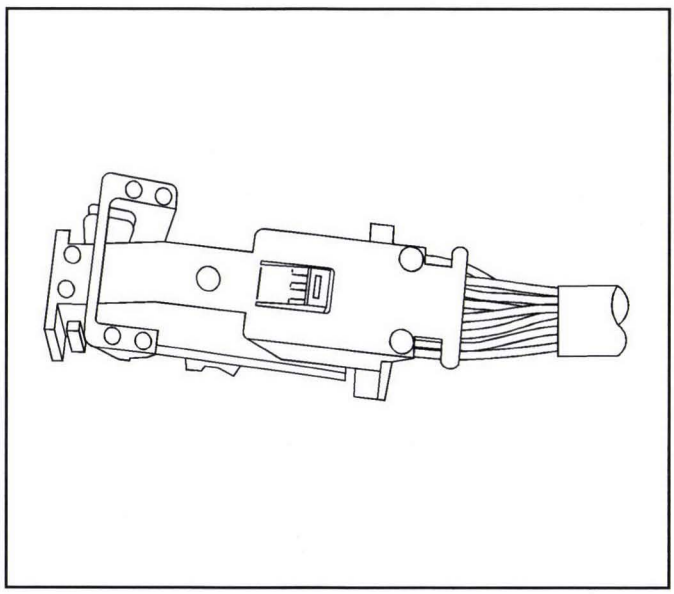
View of top of connector.

1. Locate the assist lever and lock on the top of the connector.



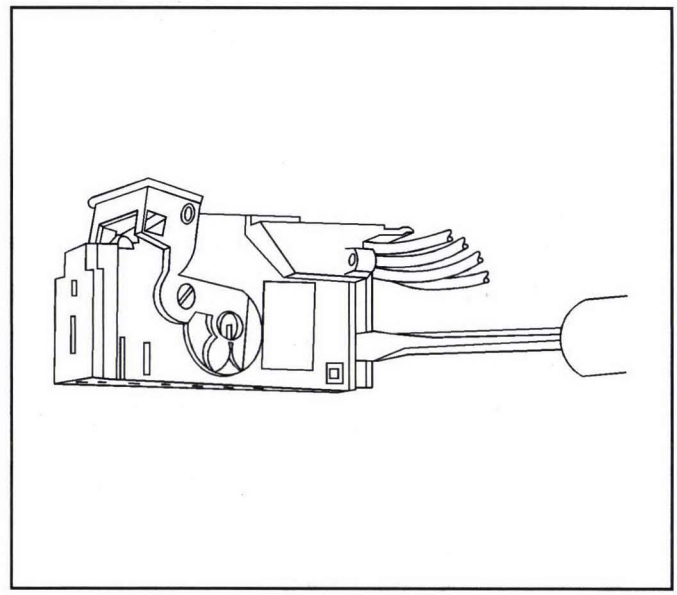
1709295

2. While depressing the lock, pull the lever over and past the lock.



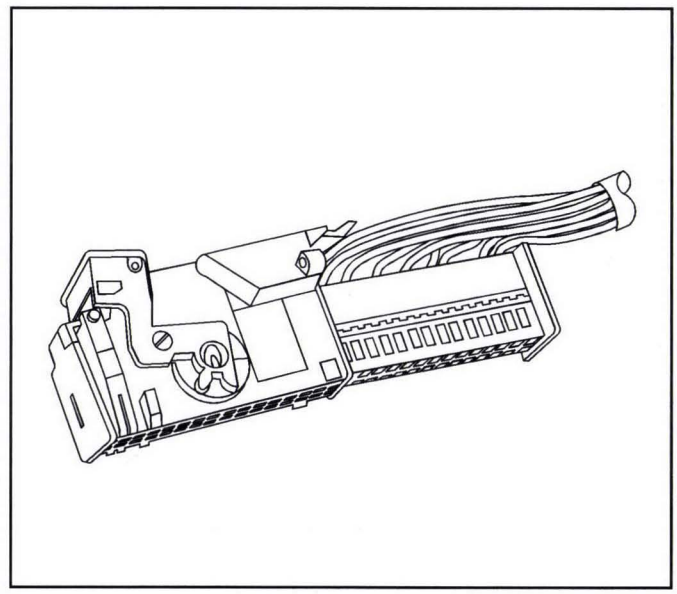
1709296

3. Disconnect the connector from the component.



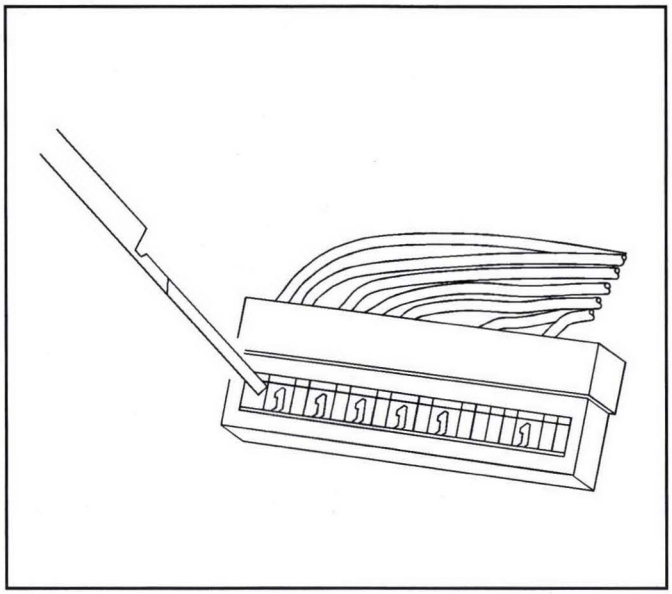
1709297

4. Locate the dress cover locking tabs at the rear of the connector. Use a small flat-blade tool to release the locking tabs. Repeat this procedure for the other locking tab.



1709298

5. Once the locking tabs are unlocked, slide the inner connector out of the rear of the connector housing.



1709299

6. Use the J-38125-12A tool to release the terminals by pressing on the tang.
7. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
8. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
9. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

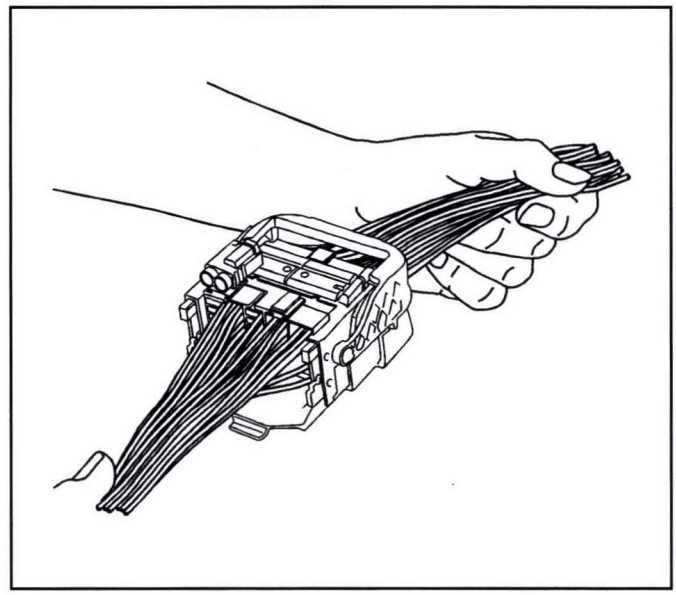
Tyco/AMP Connectors (102-Way Inline)

Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-11A* Terminal Release Tool
- *J-38125-212* Terminal Release Tool
- *J-38125-216* Terminal Release Tool
- *J-38125-221* Terminal Release Tool
- *J-38125-560* Terminal Release Tool
- *J-38125-566* Terminal Release Tool

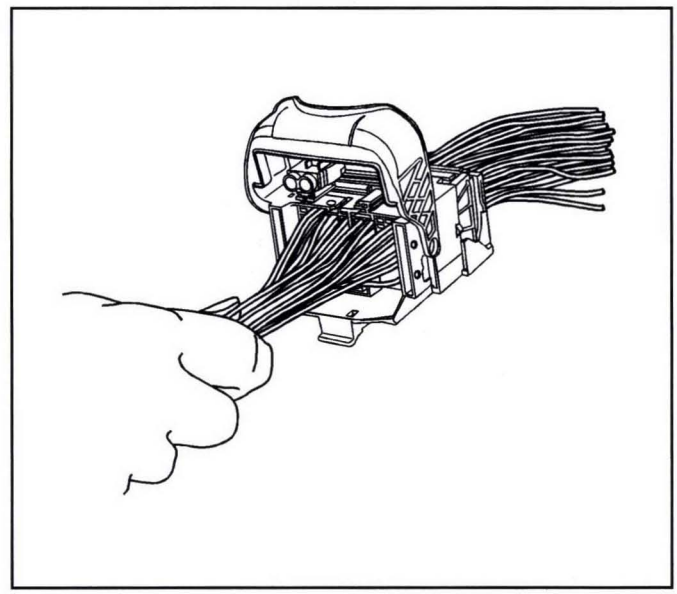
For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure



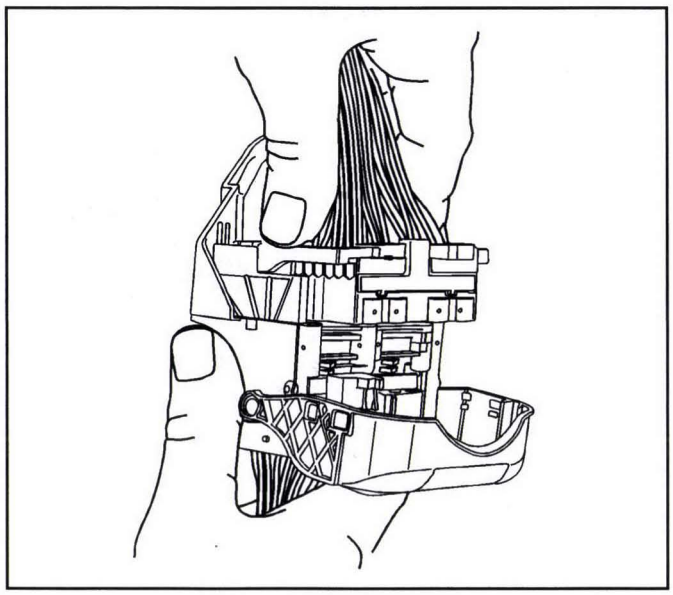
2146431

View of a typical connector in the assembled position.



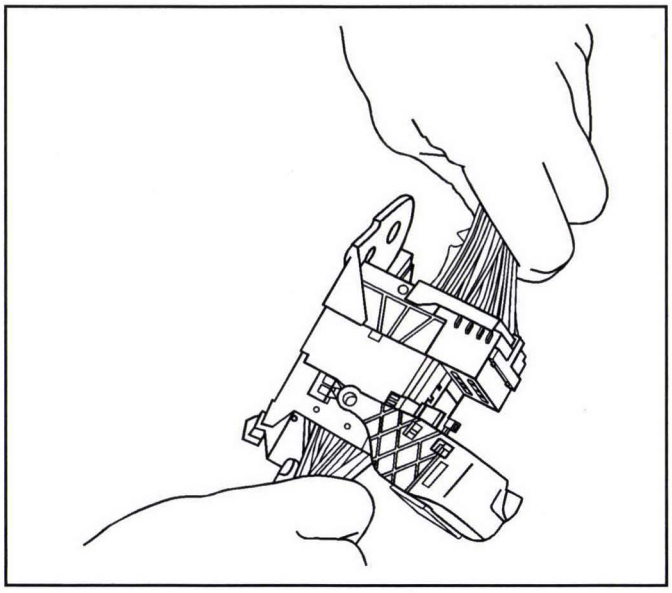
2146432

1. Pull the locking lever to the 90 degree position from the connector body.



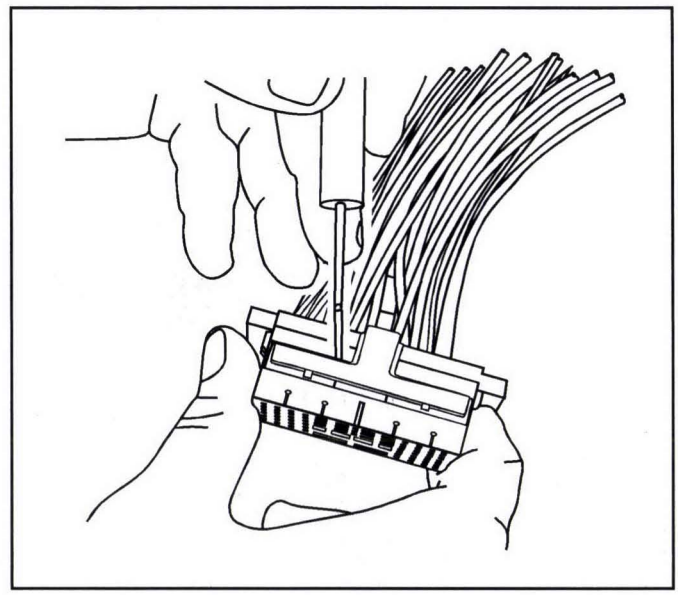
2146434

2. With the locking lever in the 90 degree position and the male connector body separated, it can be slid outward for removal.



2146435

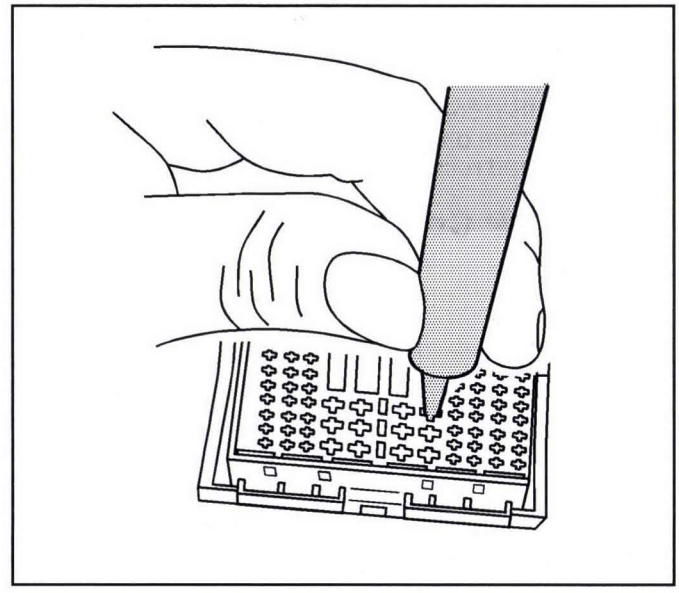
3. Slide the male connector body out away from the guide plates.



2146438

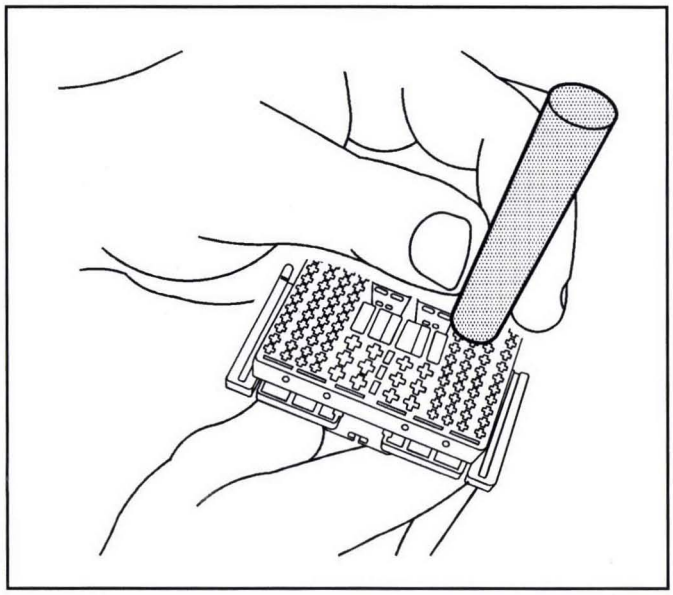
Note: During assembly the terminal position assurance (TPA) will not fully seat if any terminal is not fully seated.

4. Using terminal release tool J-38125-11A or equivalent, remove the TPA from the connector body.



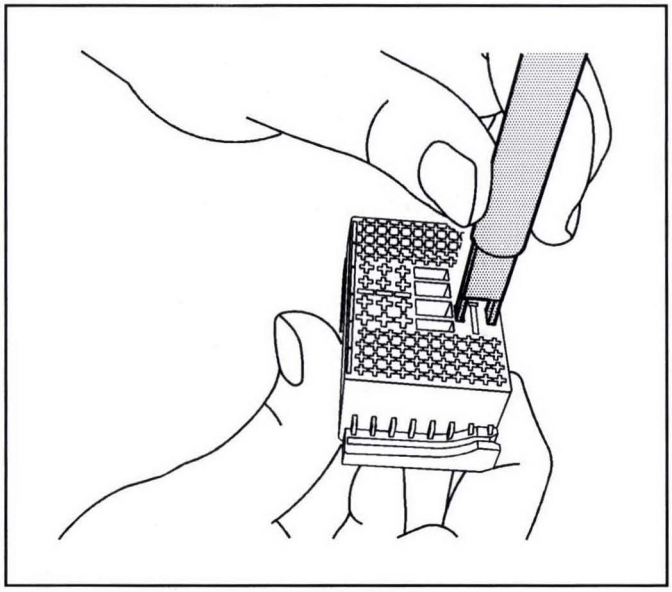
2146439

5. Using terminal release tool J-38125-566, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.



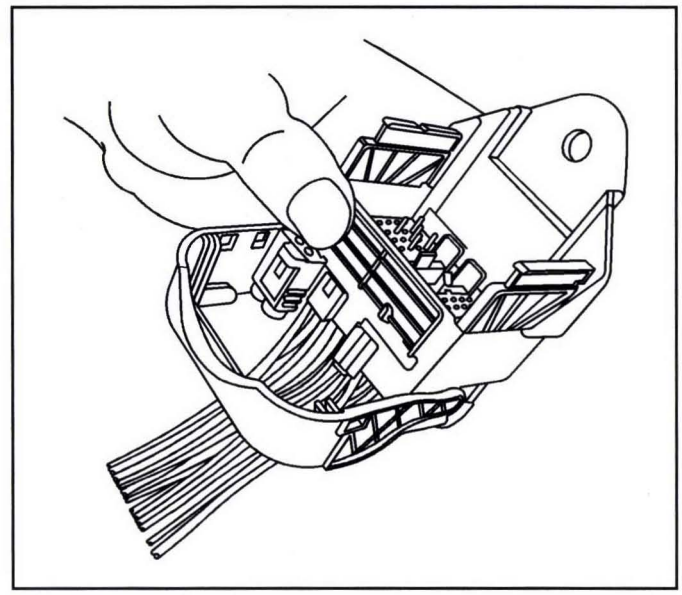
2146440

6. Using terminal release tool J-38125-560, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.



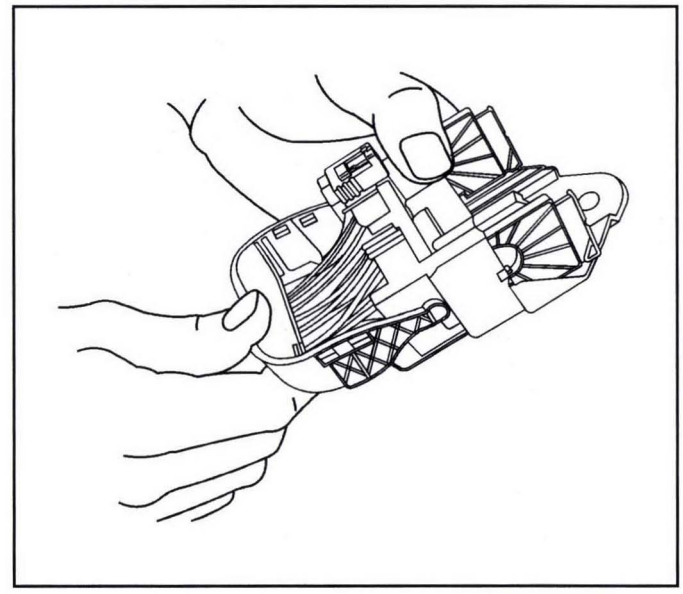
2146442

7. Using terminal release tool J-38125-221, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.



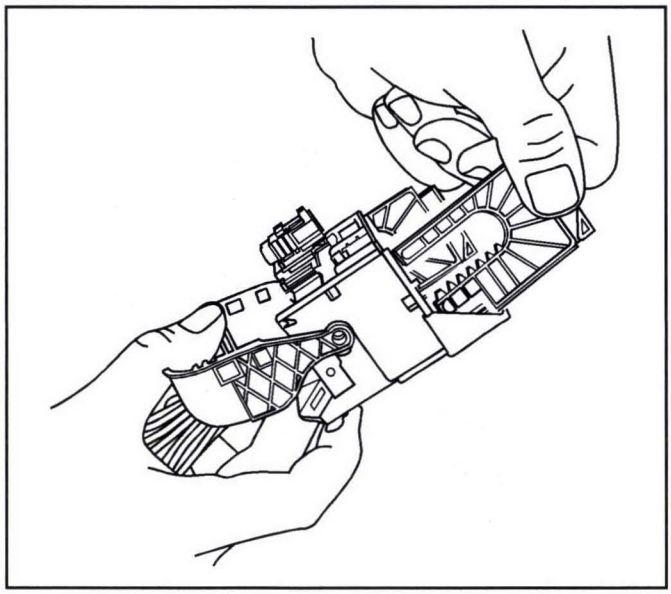
2146443

8. The female connector body may have an additional connector hooked to the edge of the body. Use terminal release tool J-38125-11A or equivalent to release the locking tab and slide the connector off the female body.



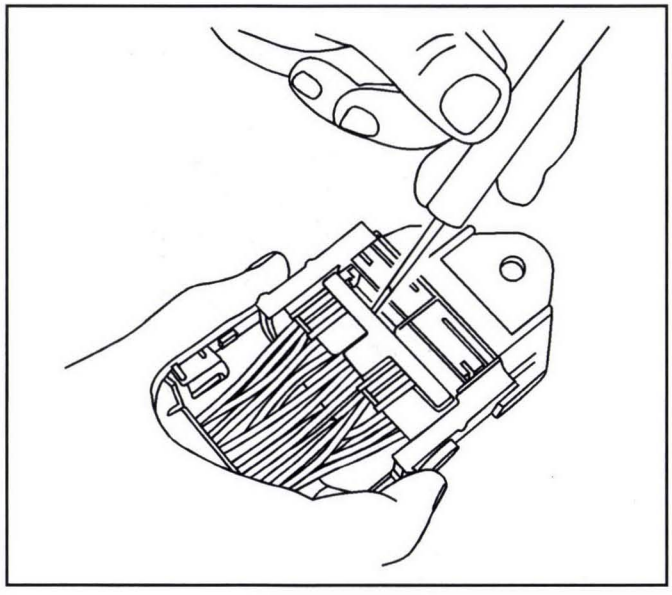
2146444

9. Move the locking lever 180 degrees from the connected position.



2146445

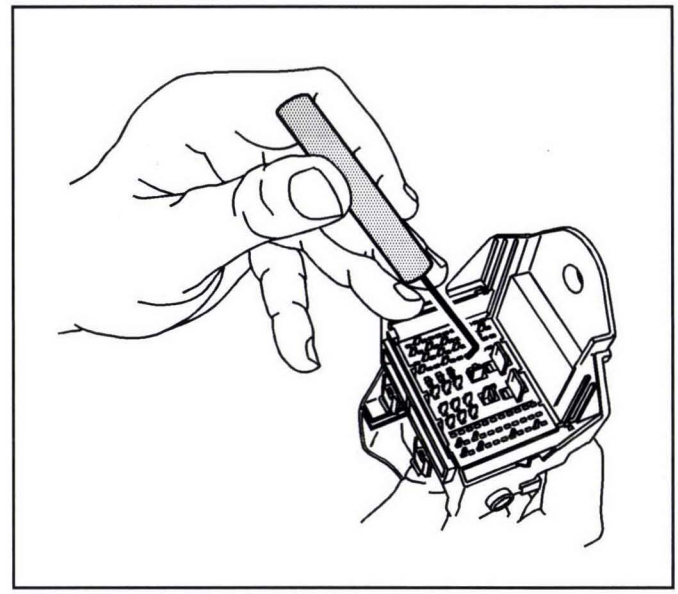
10. With the locking lever in the 180 degree position the guide plates can be removed from the connector body.



2146446

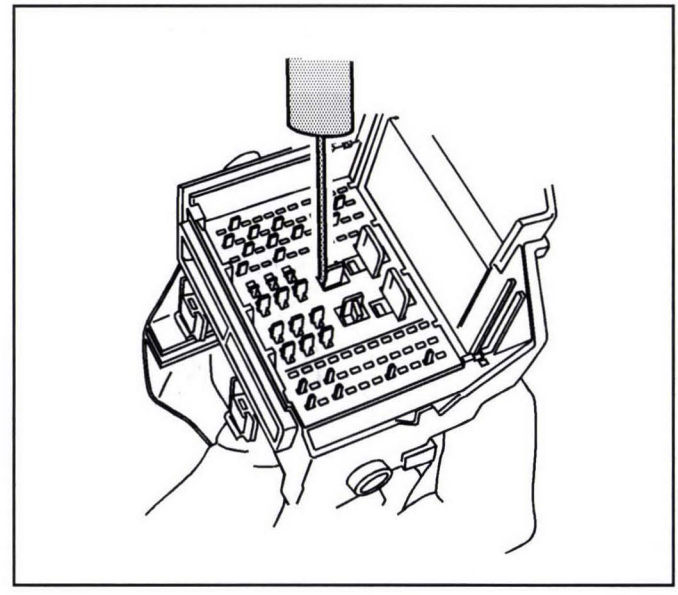
Note: During assembly the TPA will not fully seat if any terminal is not fully seated.

11. Using terminal release tool J-38125-11A or equivalent, remove the TPA from the connector body.



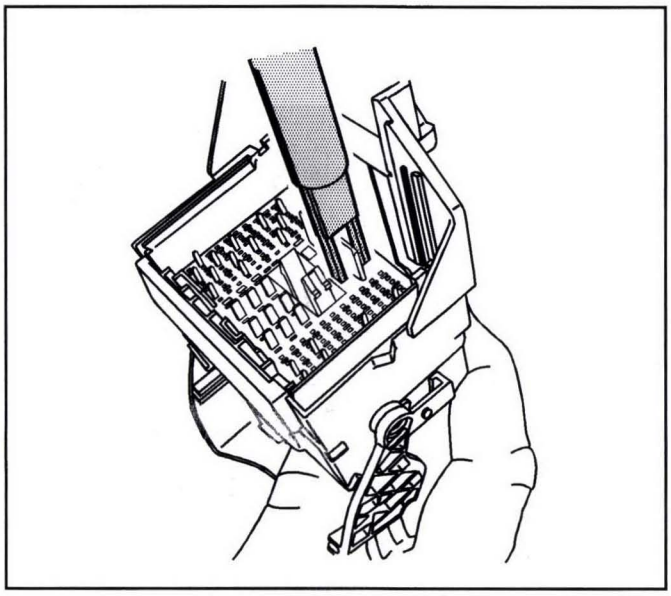
2146447

12. Using terminal release tool J-38125-216, lift the terminal plate past the terminals and out of the connector body cavity.



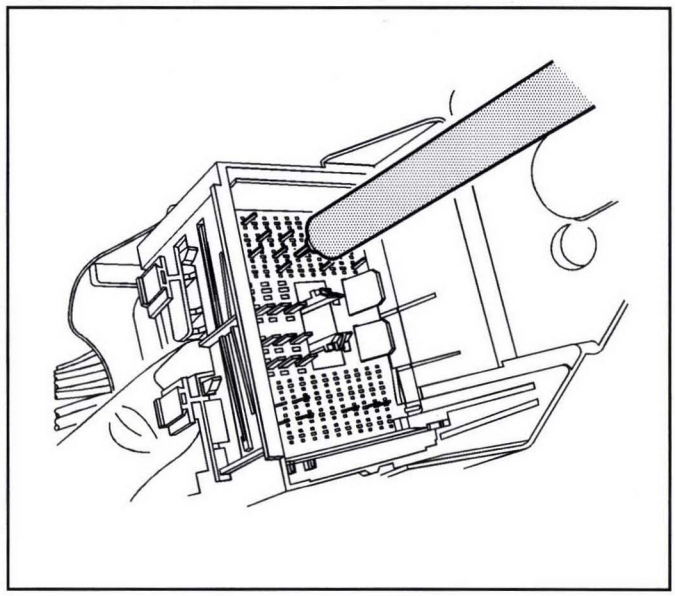
2146449

13. Terminal plate will bind slightly on each corner.



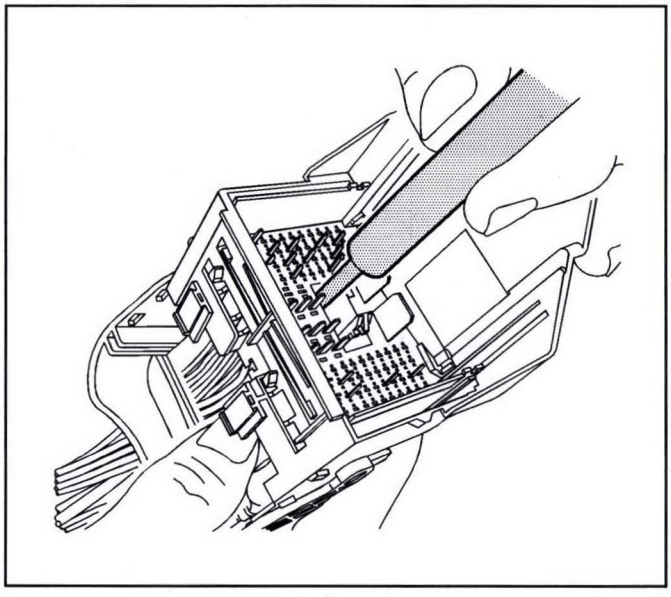
2146451

14. Using terminal release tool J-38125-221, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.



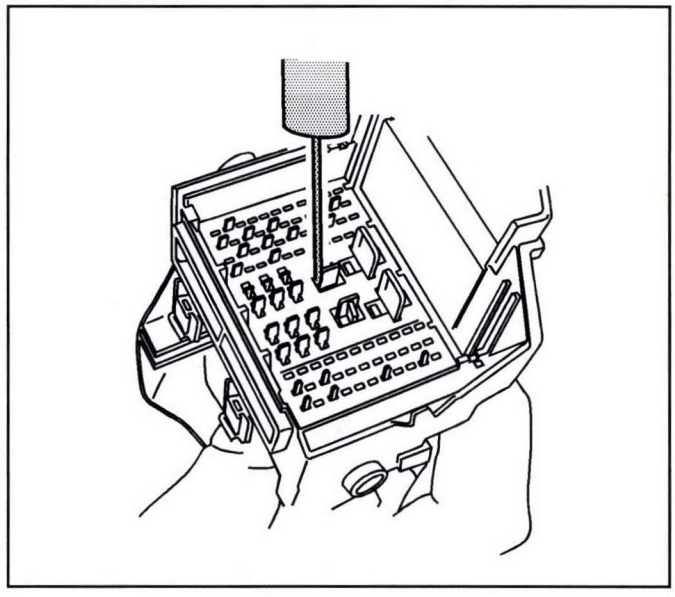
2146453

16. Using terminal release tool J-38125-560, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.



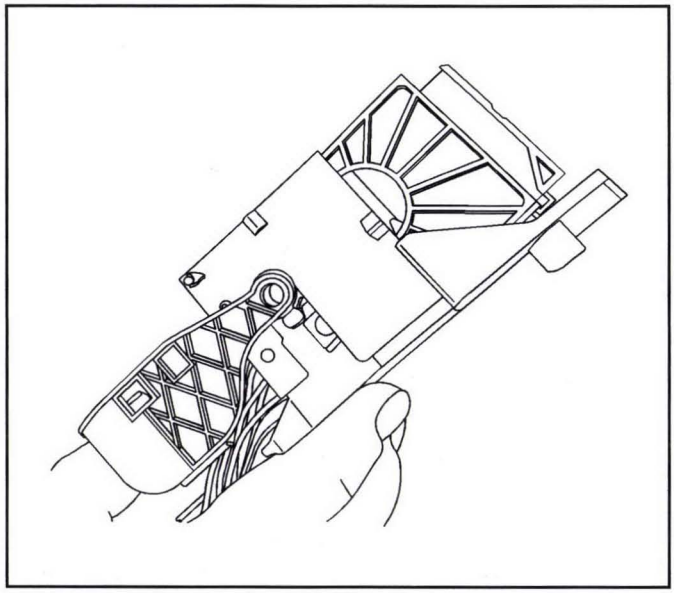
2146452

15. Using terminal release tool J-38125-212, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.



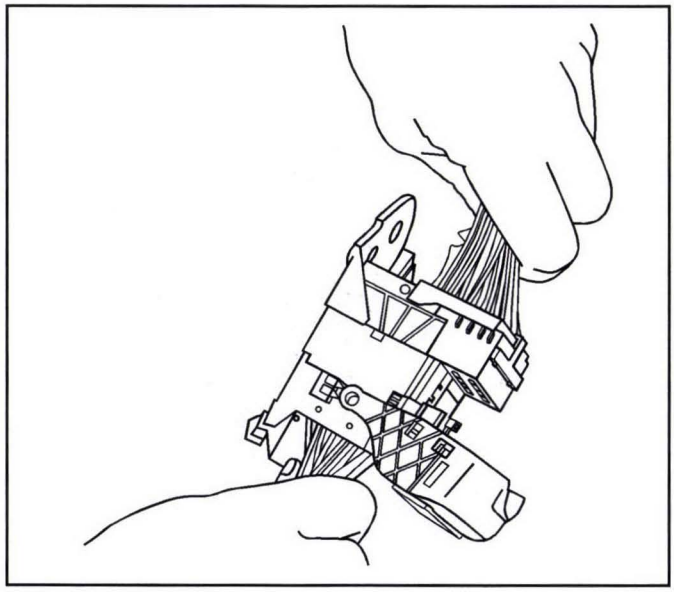
2146449

17. Press the terminal plate back into the female connector to the preset position. The plate will bind slightly on each corner.



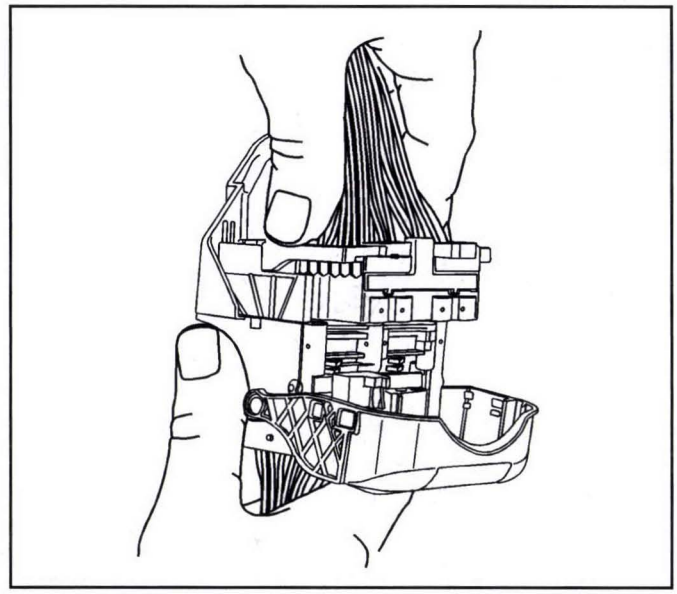
2146454

18. With the locking lever in the 180 degree position, align the guide plates to mesh with the gears on the locking lever.



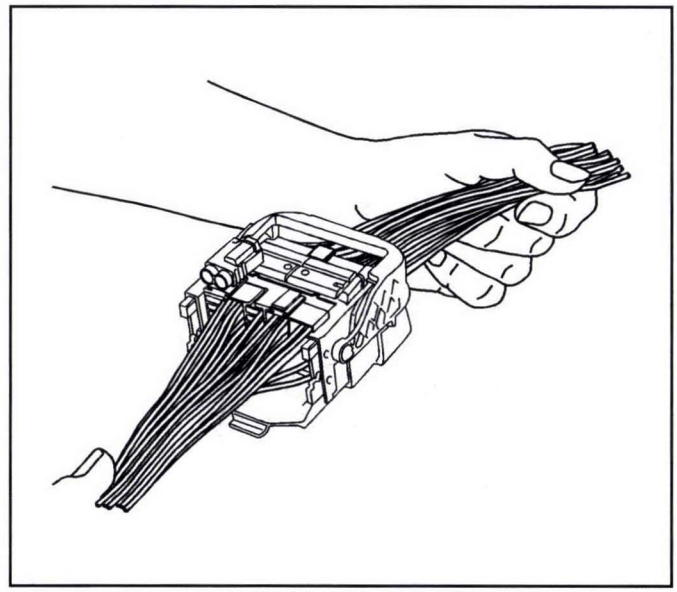
2146435

19. Slide the male connector body back inward toward the guide plates.



2146434

20. With the locking lever in the 90 degree position and the male connector body connected, it can be slid inward for assembly.



2146431

21. Move the lever into the locked position or in the assembled position. This will pull the male connector down into the female connector.
22. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
23. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

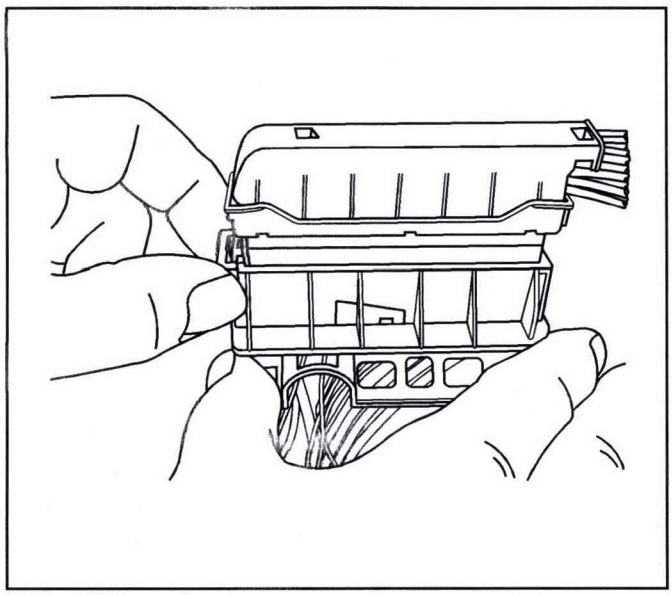
Tyco/AMP Connectors (Seat)

Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-11A* Terminal Release Tool
- *J-38125-212* Terminal Release Tool
- *J-38125-556* Terminal Release Tool
- *J-38125-560* Terminal Release Tool

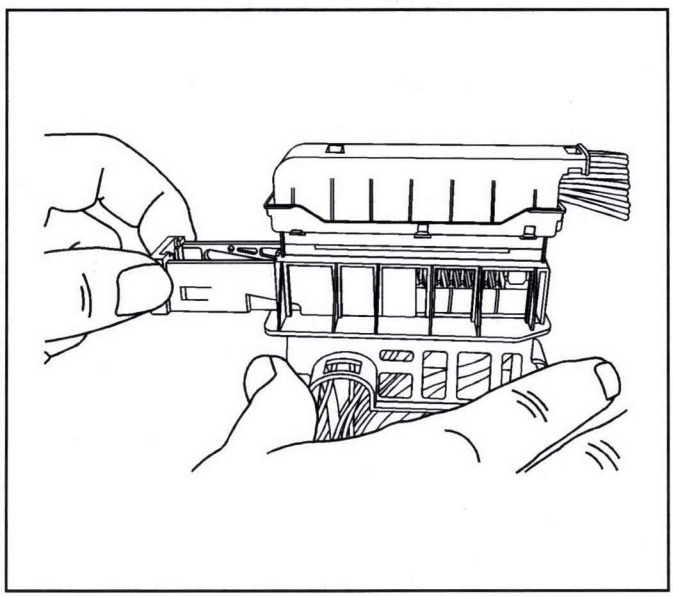
For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure



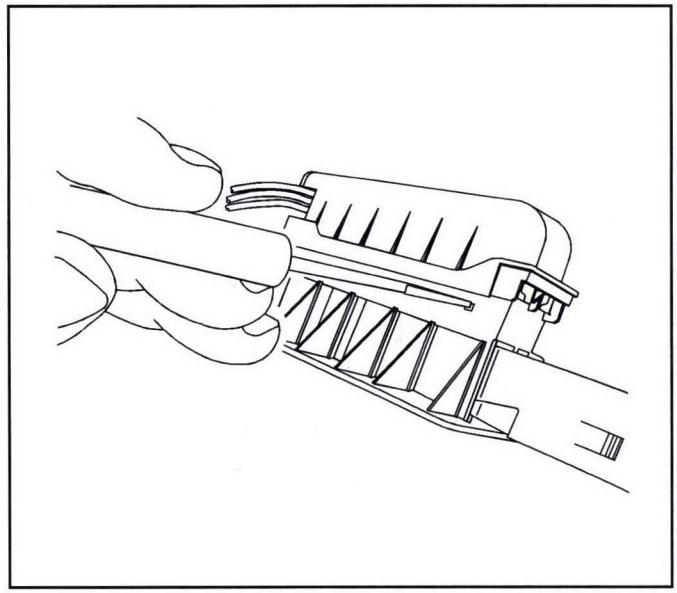
2146421

1. Grasp the locking slide lever and pull outward from the end of the connector.



2146422

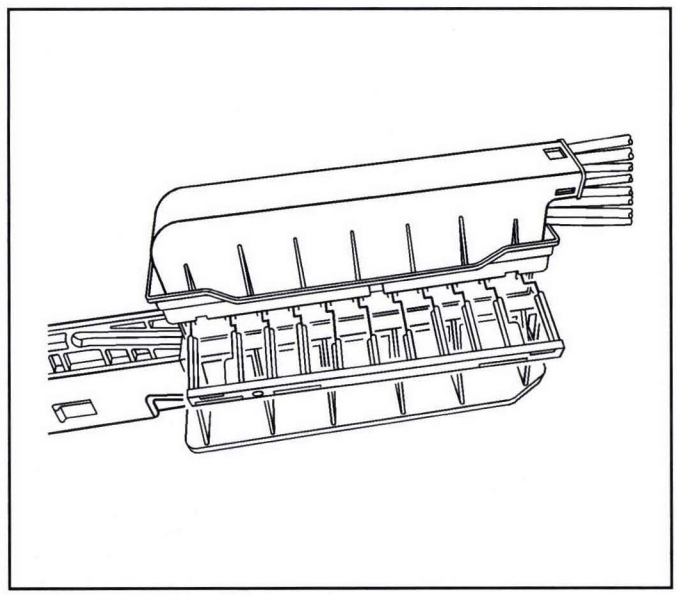
2. As the slide lever is pulled out the mating connector is lifted from the seated position.



2146424

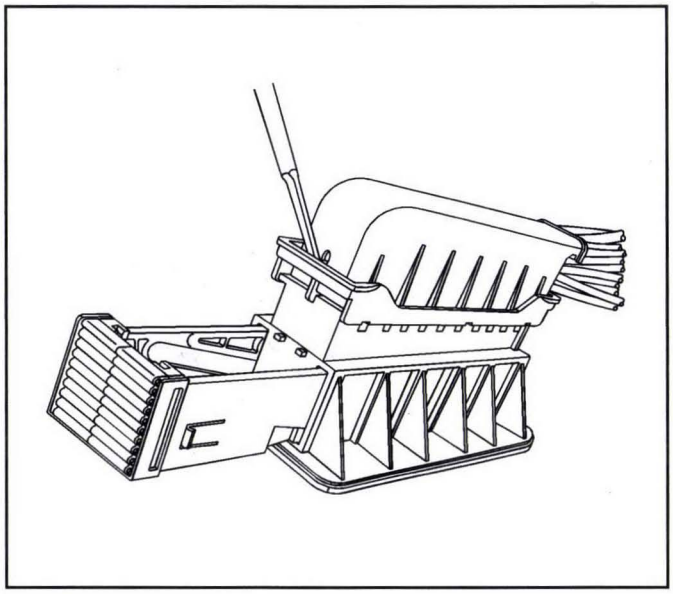
Note: Terminal position assurance (TPA) is keyed and can only be inserted in one direction.

3. Using terminal release tool J-38125-11A or equivalent, push the TPA tabs into the connector body.



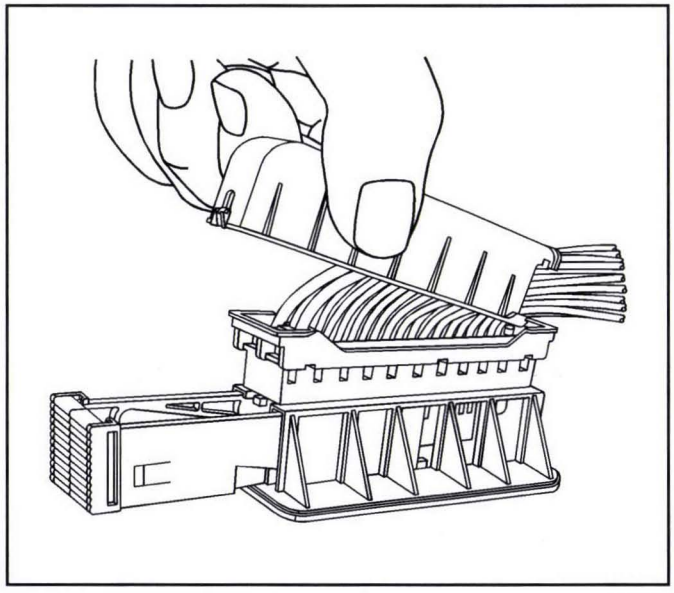
2146425

4. Pull the TPA from the connector body.



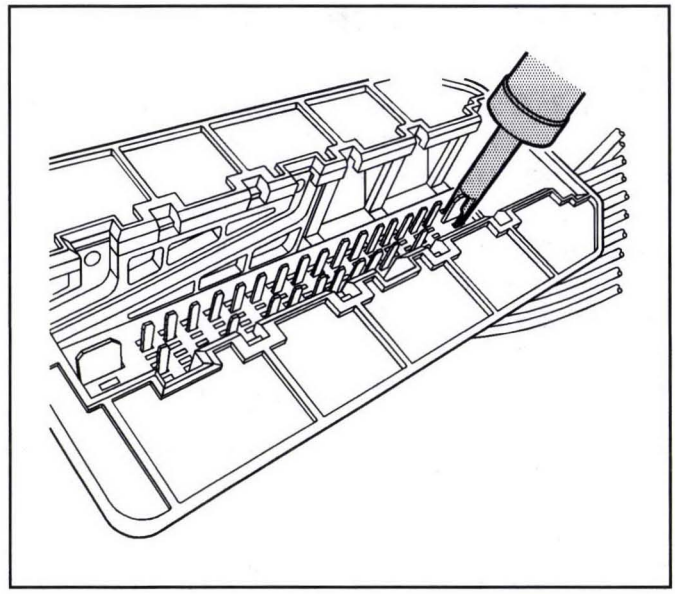
2146426

5. Using terminal release tool J-38125-11A or equivalent, release the connector wire dress cover locking tab.



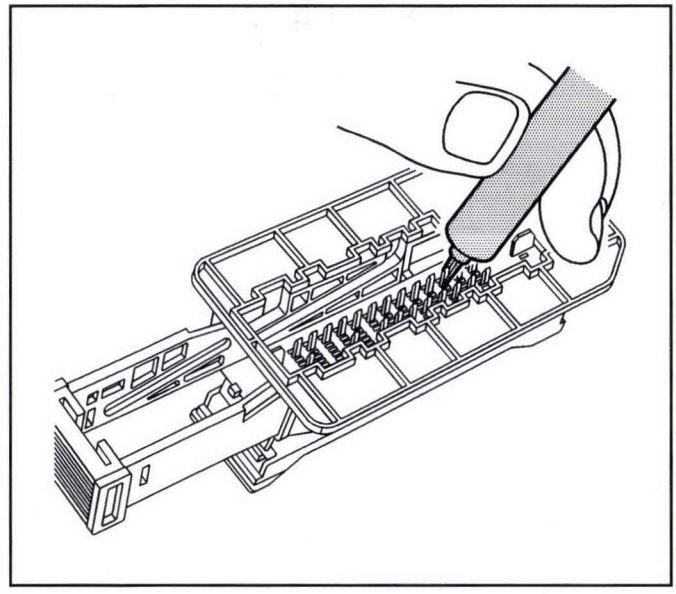
2146427

6. With the lock tab released, lift the connector wire dress cover from the connector body.



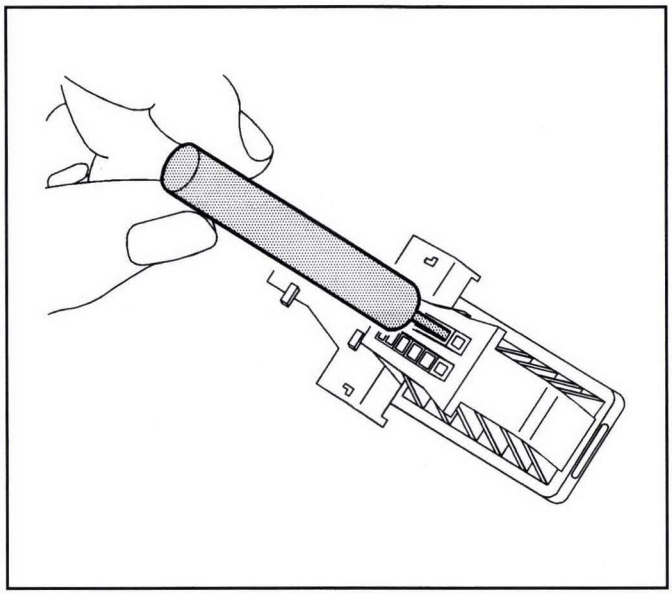
2146428

7. Using terminal release tool J-38125-212, press the prongs into the holes each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.



2146429

8. Using terminal release tool J-38125-560, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.



2146430

9. Using terminal release tool J-38125-556, press the prongs into the holes on each side of the terminal to be removed to release the lock tabs and pull the terminal out of the connector body.
10. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
11. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

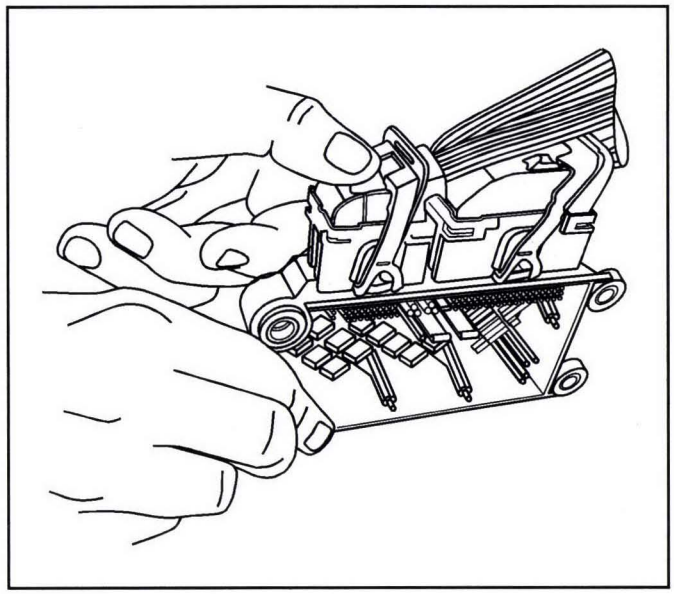
Tyco/AMP Connectors (SIR)

Special Tools

- *EL-38125–550* Terminal Release Tool Kit
- *EL-38125–580* Terminal Release Tool Kit
- *J-38125–11A* Terminal Release Tool
- *J-38125-215A* Terminal Release Tool

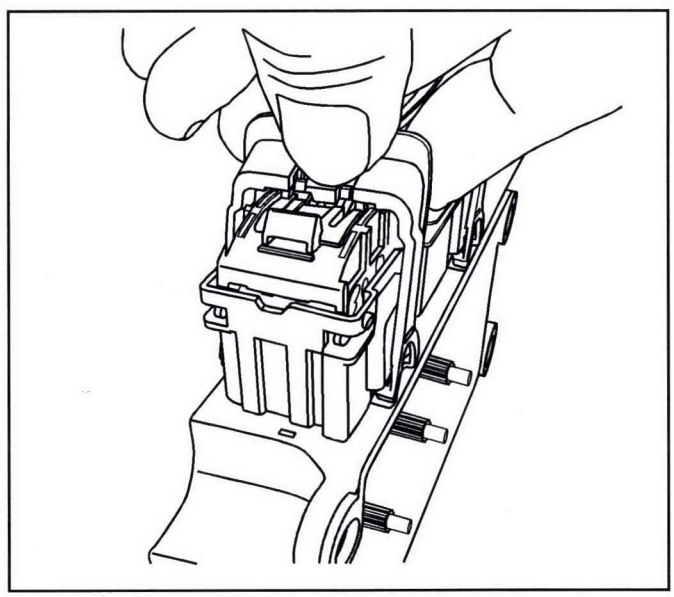
For equivalent regional tools, refer to *Special Tools on page 11-963*.

Removal Procedure



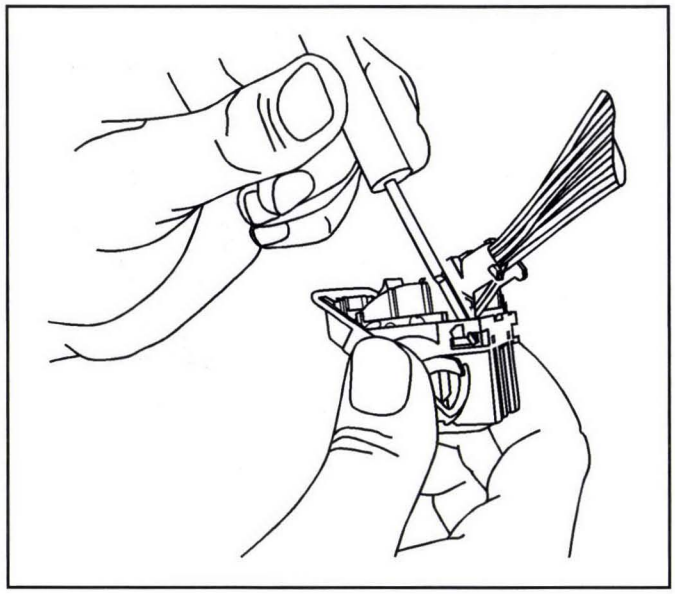
2146413

1. Using your thumbs press down and slide the red CPA away from the connector lever.



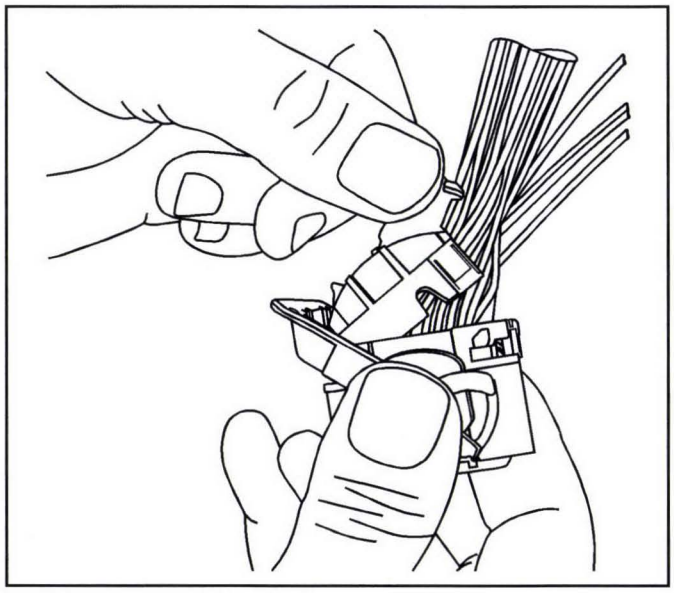
2146414

2. Using your thumb press down on the locking tab and move the lever to the released position.



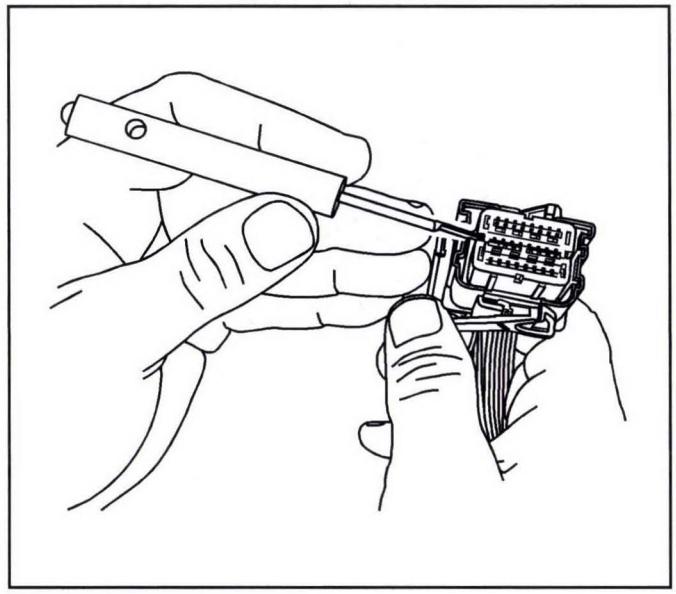
2146417

3. Using terminal tool J-38125-11A or equivalent, release the wire dress cover locking tabs.



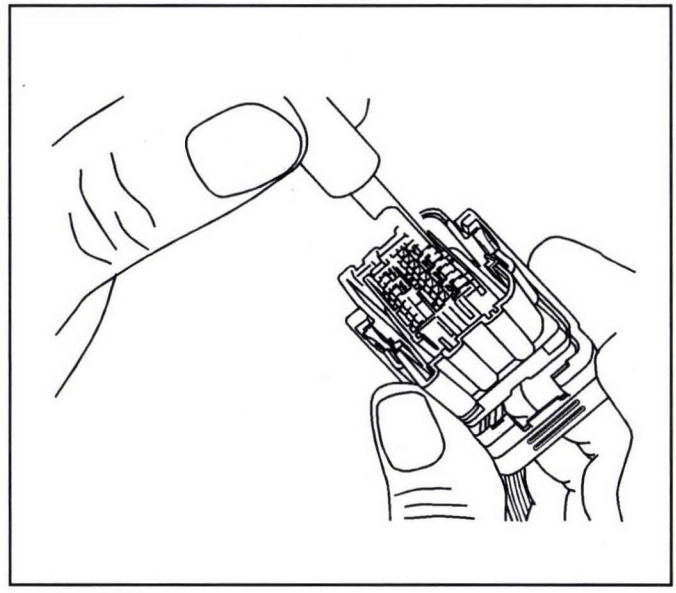
2146418

4. Pivot connector wire dress cover while removing from the connector body.



2146419

5. Using terminal tool J-38125-11A or equivalent, remove the TPA by lifting straight off the connector body.



2146420

6. Using terminal release tool J-38125-215A, place the tip of the tool on the outside edge next to the terminal and depress the lock tab and remove the rear of the connector body.

Terminal Repair Procedure

Use the appropriate terminal and crimper in order to replace the terminal.

Yazaki Connectors (2-Way)

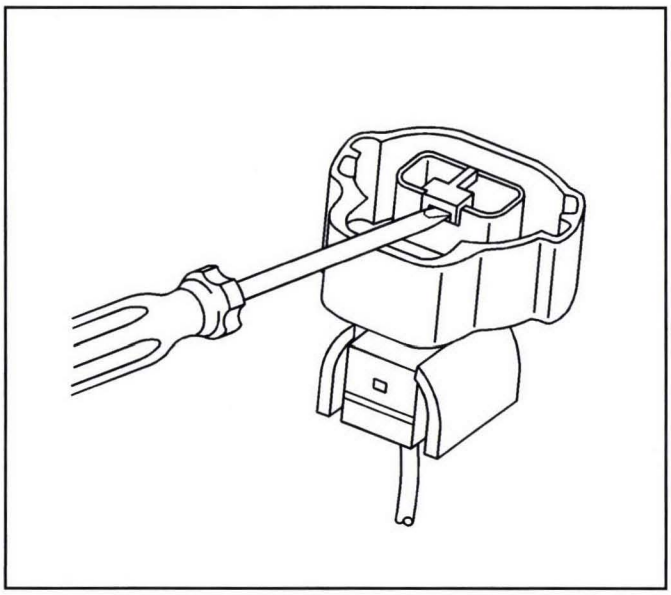
Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-553* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

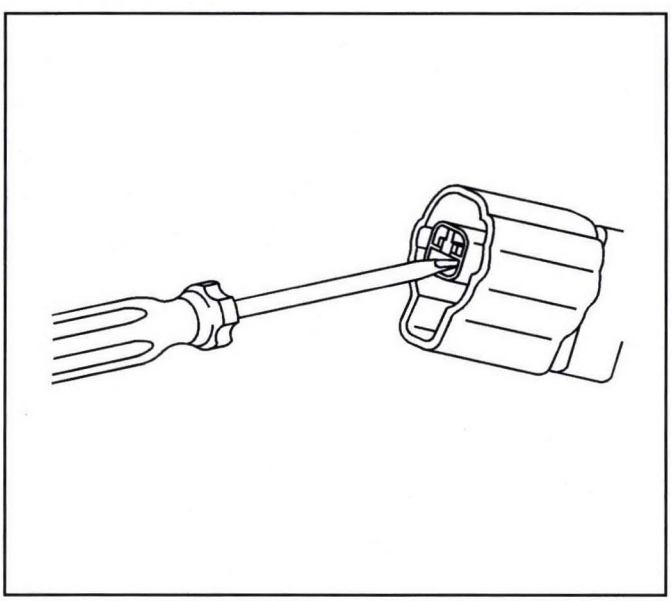
Terminal Removal Procedure

1. Disconnect the connector from the component.



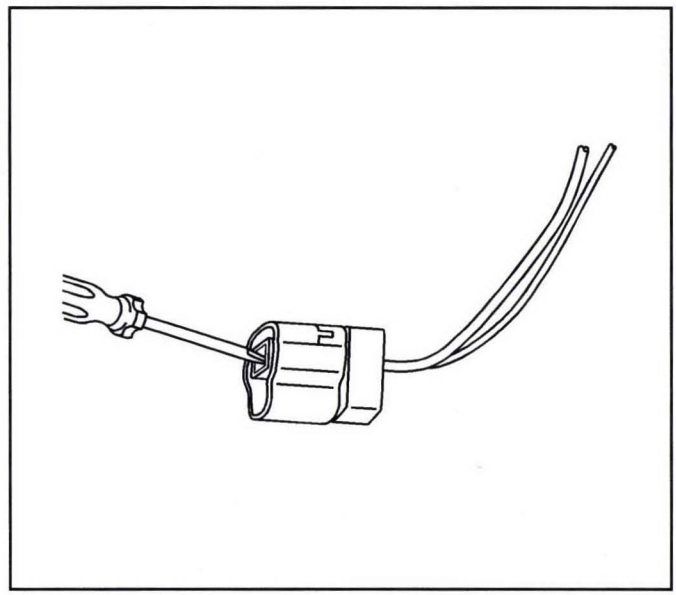
1454532

2. Insert a small flat-blade tool in the slot below the front loaded terminal position assurance (TPA) and pry up.
3. Remove the TPA by pulling it out of the connector.
4. Push the wire side of the terminal that is being removed toward the connector and hold it in position.



1454546

5. Insert the J-38125-553 on a slight upward angle into the cavity below the terminal to be removed. Ensure that the pointed on the end of the tool is facing the bottom of the terminal and it stays in contact with the terminal until it stops on the plastic terminal retainer.



1454553

6. Gently pry the plastic terminal retainer down and carefully pull the terminal out of the connector. Always remember never use force when pulling a terminal out of a connector. If the terminal is difficult to remove, repeat the entire procedure.
7. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
8. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

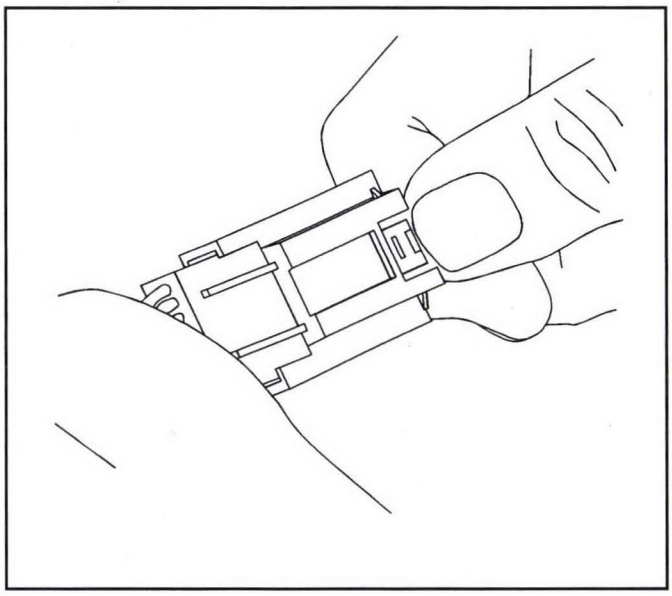
Yazaki Connectors (16-Way)

Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *J-38125-215* Terminal Release Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Terminal Removal Procedure

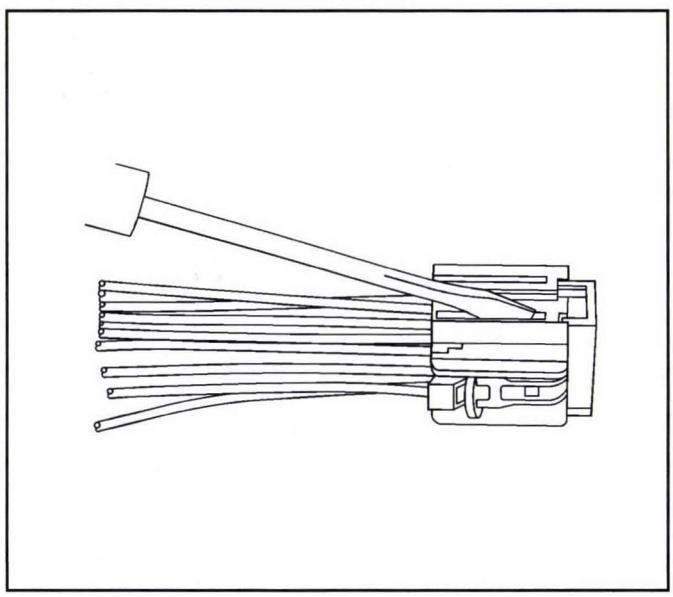


1709336

1. While depressing the lock, pull the two connector halves apart.

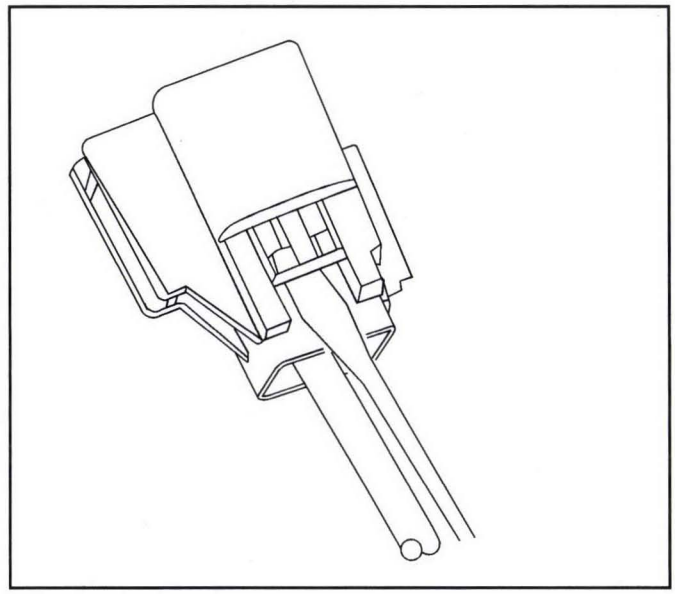
   Note: The terminal position assurance (TPA) is fragile and may break if not done carefully.

2. Use a small flat-blade tool to very carefully push the TPA towards the face of the connector on both sides of the connector.



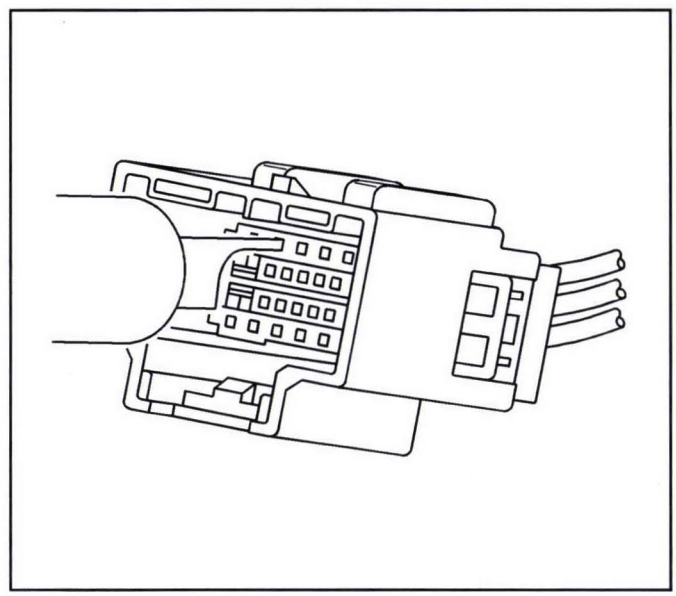
1709329

3. View of the male half of the connector with female terminals.



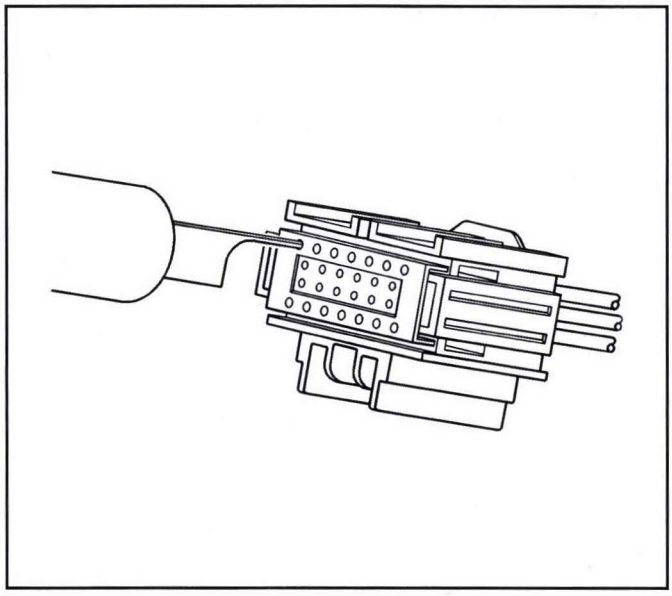
1709335

4. View of the female half of the connector with male terminals.
5. Use the J-38125-215 tool to release the terminals by inserting the tool into the terminal release cavity.



1709332

6. View of the female half of the connector with male terminals.



1709331

7. View of the male half of the connector with female terminals.
8. While holding the removal tool in place, gently pull the wire out of the back of the connector. Always remember never use force when pulling a terminal out of a connector.
9. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
10. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Repairing Connector Terminals (Terminated Lead Repair)

Special Tools

EL-38125-10 Splice Sleeve Crimp Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Note: All repairs near the engine manifold, turbo engine and all exhaust pipes should follow the High Temperature Wiring Repairs procedures.

For high temperature wiring repairs, refer to *High Temperature Wiring Repairs on page 11-889*.

Terminated leads are terminals that are crimped onto wires. The terminated lead can be used throughout the vehicle since it is designed for temperatures up to 150° C. The length of the wire is 450 mm.

1. Use the connector end view to identify the correct terminated lead.
2. The terminated lead package should include a DuraSeal splice sleeve. If not, use the chart to in Splicing Copper Wire Using Splice Sleeves to identify the correct DuraSeal splice sleeve, refer to *Splicing Copper Wire Using Splice Sleeves on page 11-890*.

Repairing Connector Terminals (Terminal Repair)

Special Tools

- *J-38125–580* Terminal Repair Kit
- *J-38125-6* Crimp Tool
- *J-38125-7* Crimp Tool
- *J-38125-8* Crimp Tool
- *J-38125-64* Crimp Tool
- *J-38125-101* Crimp Tool
- *J-38125-641* Crimp Tool
- *J-38125-642* Crimp Tool
- *J-38125-643* Crimp Tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Use the following repair procedures to repair each type of terminal:

- For push to seat terminals, refer to *Delphi Connectors (Weather Pack) on page 11-905* or *Delphi Connectors (Pull To Seat) on page 11-907* or *Delphi Connectors (Push To Seat) on page 11-906* or *Delphi Connectors (12-Way) on page 11-913* or *Delphi Connectors (Micro .64) on page 11-910* or *Delphi Connectors (Steering Gear) on page 11-915* or *Delphi Connectors (Micro-Pack 100W) on page 11-908*.
- For pull to seat terminals, refer to *Delphi Connectors (Weather Pack) on page 11-905* or *Delphi Connectors (Pull To Seat) on page 11-907* or *Delphi Connectors (Push To Seat) on page 11-906* or *Delphi Connectors (12-Way) on page 11-913* or *Delphi Connectors (Micro .64) on page 11-910* or *Delphi Connectors (Steering Gear) on page 11-915* or *Delphi Connectors (Micro-Pack 100W) on page 11-908*.

Note: The first step for all terminal repairs is to find the connector end view in SI.

Cable Seal Terminals

1. Cut off the terminal between the core and the insulation crimp to minimize any wire loss.
2. Remove the old seal.
3. Apply the correct cable seal, per the wire gauge size, from the kit. Slide the seal back along the wire to enable removal of the insulation.
4. To minimize wire loss, remove only the insulation required.
5. Using the connector end view, determine the correct crimp tool and crimp jaw.
6. Align the seal with the end of the cable insulation.
7. Position the stripped wire and seal in the terminal.
8. Hand Crimp the core wings first.
9. Hand Crimp the insulation wings around the seal and the cable.
10. Solder all of the hand crimp terminals except the Micro-Pack 100 and 0.64 sizes.

Unsealed Terminals

1. Cut off the terminal between the core and the insulation crimp to minimize any wire loss.
2. To minimize wire loss, remove only the insulation required.
3. Position the stripped wire in the terminal.
4. Hand Crimp the core wings first.
5. Hand Crimp the insulation wings around the cable.
6. Solder all of the hand crimp terminals except the Micro-Pack 100 and 0.64 sizes.

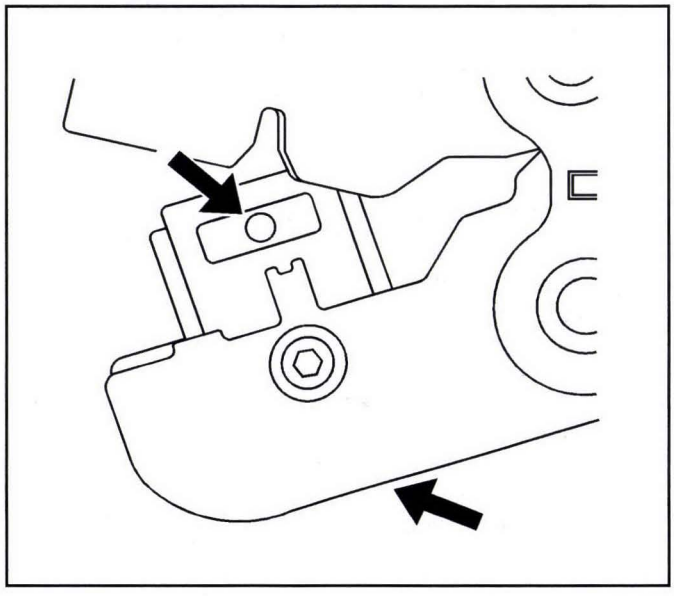
Micro-Pack 100W Size Terminal

The Micro-Pack 100W connectors have small terminals that are difficult to handle and hold when crimping. In order to aid the technician when crimping these terminals, a new crimping tool was developed. The J 38125-101 (W jaw) crimping tool was developed to crimp Micro-Pack 100W terminals. The J 38125-101 (W jaw) crimping tool has a terminal holding block that will hold the terminal in place while the terminal is being crimped. After the terminal is removed from the connector perform the following procedure in order to repair Micro-Pack 100 terminals.

1. Cut the wire as close to the terminal as possible.

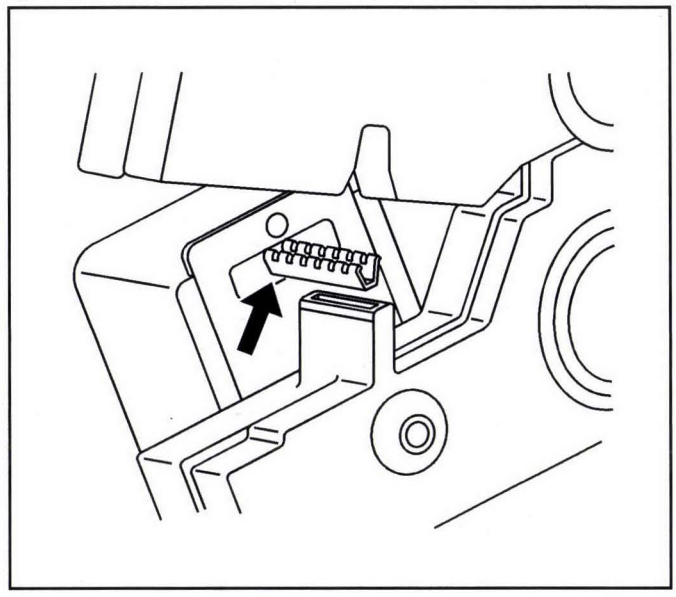
   Note: After cutting the damaged terminal from the wire, determine if the remaining wire is long enough to reach the connector without putting a strain on the wire. If the wire is not long enough, splice a small length of the same gauge wire to the existing wire, then crimp the new terminal on the added wire.

2. Strip 5 mm (3/16 in) of insulation from the wire.



862167

3. Depress the spring loaded locator of the J 38125-101 (W jaw) crimping tool until the terminal holder is completely visible.



862185

4. Insert the terminal into the crimp tool until the core wings are flush with the anvil on the crimp tool. Be sure that the wings are pointed toward the crimp tool former and release the spring locator. The locator will hold the terminal in place. Inspect the alignment of the terminal wings with the crimp tool former. If the terminal wings are wider than the crimp tool former, remove the terminal and bend the terminal wings in slightly.
5. Place stripped wire into terminal.
6. Crimp the new terminal to the wire. If a jam occurs, press the emergency release to open applicator.

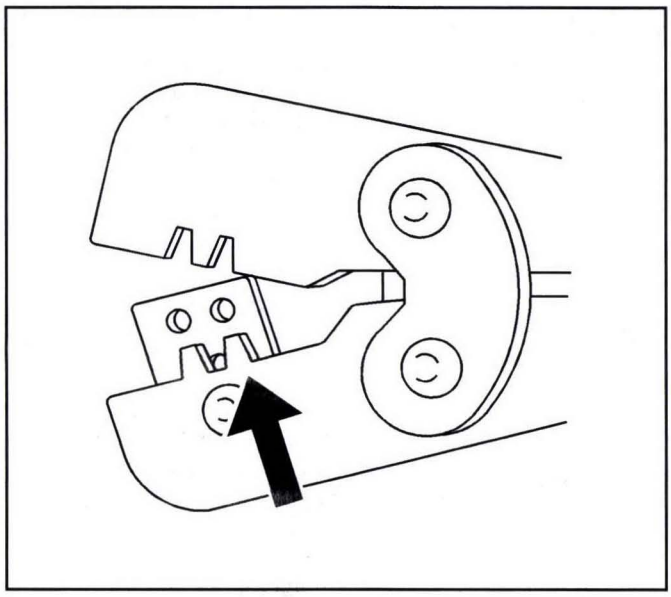
Micro 0.64 Size Terminal

The Micro 64 connectors have small terminals that are difficult to handle and hold when crimping. In order to aid the technician when crimping these terminals, a new crimping tool was developed. The J 38125-64 (M jaw) was developed to crimp Micro 64 terminals. The J-38125-64 crimping tool has a terminal holding block that will hold the terminal in place while the terminal is being crimped. The J-38125-64 crimping tool is also designed to crimp both the wire and the insulation at the same time.

After the terminal is removed from the connector perform the following procedure in order to repair Micro 64 terminals.

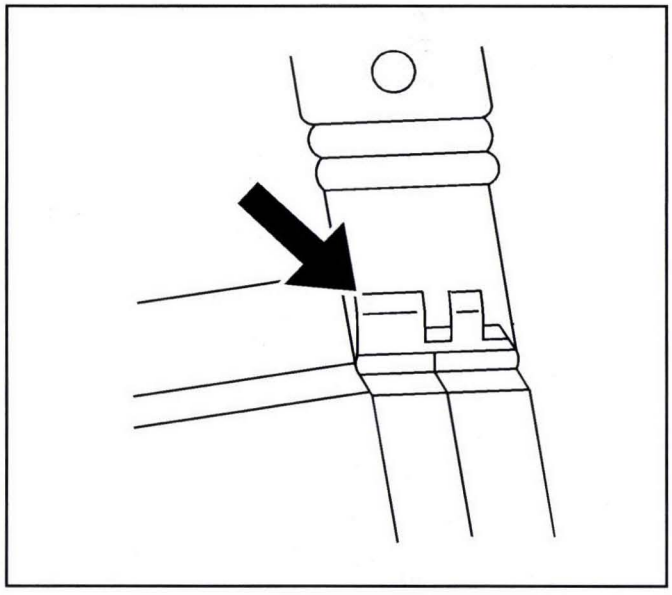
Note: After cutting the damaged terminal from the wire, determine if the remaining wire is long enough to reach the connector without putting a strain on the wire. If the wire is not long enough, splice a small length of the same gauge wire to the existing wire, then crimp the new terminal on the added wire.

1. Cut the wire as close to the damaged terminal as possible.
2. Strip 5 mm (3/16 in) of insulation from the wire.



875015

3. Depress the spring loaded locator of the crimping tool until the terminal holder is completely visible.



875016

4. Insert terminal into the appropriate terminal holder until it hits bottom and stops. The correct terminal holder is determined by the wire size. Also ensure that the terminals wings are pointing towards the former on the tool and the release locator.
5. Insert the stripped cable into the terminal. Insulation should be visible on both sides of the terminal insulation wings.
6. Compress the handles until the ratchet automatically releases.
7. Place the terminal into the appropriate cavity and assemble the connector.

Terminal Removal

Special Tools

- *EL-38125-550* Terminal Release Tool Kit
- *EL-38125-580* Terminal Release Tool Kit
- *EL-35616* Terminal Test Probe Kit

For equivalent regional tools, refer to *Special Tools on page 11-963*.

Note: All repairs near the engine manifold, turbo engine and all exhaust pipes should follow the High Temperature Wiring Repair procedures.

1. Find the appropriate connector end view within the connector end view section. The connector end view has the following information:
   - Diagnostic probe tool
   - Terminal release tool
   - Terminal/terminated lead part numbers

   Note: Not using the proper test kit probe may cause damage to the terminal(s) that are probed.
2. Determine if a terminal is damaged.
   - Locate the diagnostic probe tool from the connector end view. The connector end view describes the color and part number to help the technician find and use the correct tool.
   - Connect the probe tool to the Digital Multimeter.
   - Insert the probe tool into the cavity and follow the procedures from the *Troubleshooting with a Digital Multimeter on page 11-873*.
3. Disconnect the connector body to perform the repair.
4. Use the following procedure to remove the terminal from the connector body.

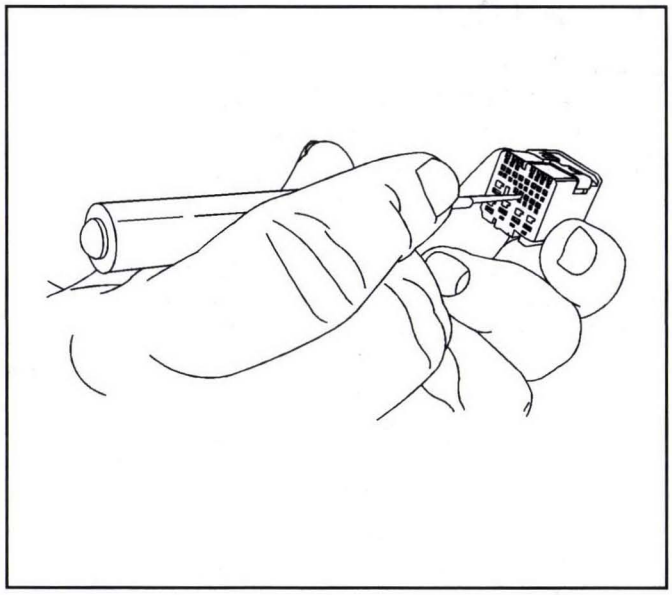
   Note: Several procedures for specific connector bodies are called out in the Wiring Repairs section.

   - The terminal position assurance (TPA) and connector position assurance (CPA) should be removed before releasing the terminal for the connector body.
   - Look at the connector end view to locate the cavity of the damaged terminal and find the proper terminal release tool from the terminal release tool kit.

     Note: Using the incorrect terminal release tool can damage the connector body.

     Note: Some terminals have a lever that must be disengaged before the terminal can be released.

   - Insert the terminal release tool into the cavity.



1774105

5. Gently pull the wire out of the back of the connector.
6. Repair the terminal by following the *Repairing Connector Terminals (Terminated Lead Repair) on page 11-949* or *Repairing Connector Terminals (Terminal Repair) on page 11-949* procedure.
7. Insert the repaired terminal back into the cavity. Repeat the diagnostic procedure to verify the repair and reconnect the connector bodies.

Repair Instructions

GMLAN and Media Oriented Systems Transport (MOST) Wiring Repairs

Special Tools

- *EL-38125-10* Splice Sleeve Crimping Tool
- DuraSeal splice sleeves
- A wire stripping tool

For equivalent regional tools, refer to *Special Tools on page 11-963*.

The DuraSeal splice sleeves have the following 2 critical features:

- A special heat shrink sleeve environmentally seals the splice. The heat shrink sleeve contains a sealing adhesive inside.
- A cross hatched (knurled) core crimp provides necessary contact integrity for the sensitive, low energy circuits.

The GM Local Area Network (GMLAN) System requires special wiring repair procedures due to the sensitive nature of the circuitry. Follow the specific procedures and instructions when working on GMLAN connectors and terminals.

GMLAN Repairs

Note: When making a repair to any GMLAN network, the original wire length after the repair must be the same length as before the repair. If the network is a twisted pair, the twist must be maintained after the repair is completed.

GMLAN has 2 types of networks, low speed and high speed. Low speed GMLAN has a single wire and works at slow speeds. High speed GMLAN has 2 wires in a twisted pair and works at higher speeds. For more information on GMLAN, refer to *Data Link Communications Description and Operation on page 11-237*.

GMLAN Connector Terminal Repair

Note: A terminated lead can be used to replace damaged connector terminals for both high speed and low speed GMLAN systems. When making a connector terminal repair on a GMLAN high speed system with twisted pair wires, do not untwist the wires more than necessary to make the repair.

If the individual terminals are damaged on any GMLAN connection, use the appropriate connector repair procedure in order to repair the terminal. Refer to *Connector Repairs on page 11-895* for the appropriate connector repair procedure.

GMLAN Wire Repair

Note: Refer to Wiring Repairs in the service information connector end views or the vehicle schematics in order to determine the correct wire size for the circuit you are repairing. You must obtain this information in order to ensure circuit integrity.

If any wire except the pigtail is damaged, repair the wire by splicing in a new section of wire of the same gauge size (0.5 mm^2, 0.8 mm^2, 1.0 mm^2 etc.). Use the DuraSeal splice sleeves and *EL-38125-10* tool. For wiring repair, refer to *Splicing Copper Wire Using Splice Sleeves on page 11-890*.

Media Oriented Systems Transport (MOST) Wiring Repair

Note: If harness repair/analysis is performed, MOST bus Twist Pair unshielded wire should be 0.22 mm gauge wire with at least one twist per each 1 45/64 inch (45 mm) and must not be untwisted for more than 3 15/16 of an inch (10 cm).

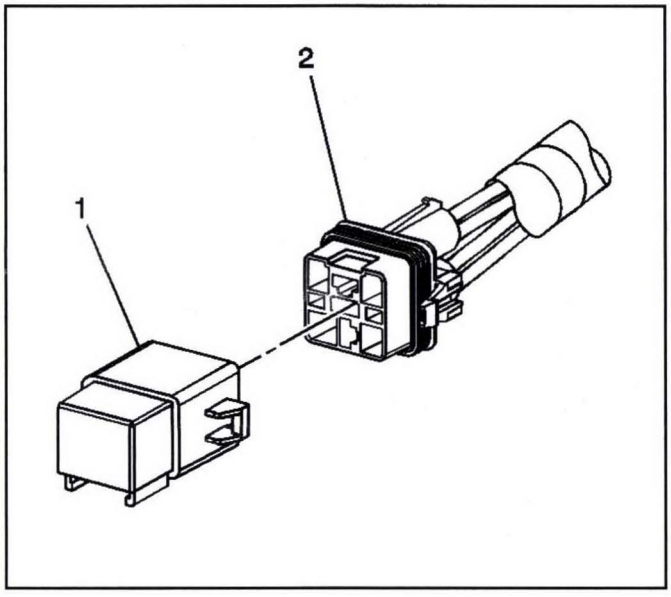
The following conditions need to be met to ensure a valid continuity:

- Untwisted length for all MOST 50 circuits at each wire harness connector should be no longer 50 mm max (25 mm preferred).
- When wire repairs are made, a minimum 25 twists/meter for all MOST 50 circuits.
- MOST 50 has specific receive and transmit I/O.

The transmit of one module is connected to receive of the next module in ring topology.

Relay Replacement (Attached to Wire Harness)

Removal Procedure

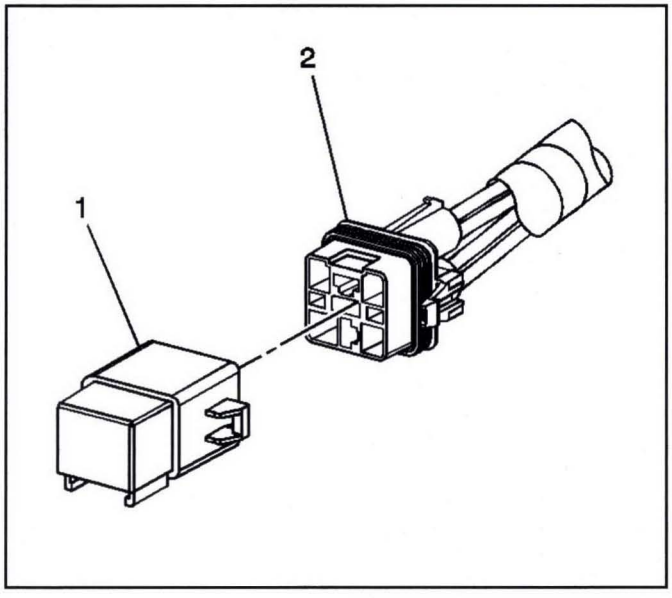


791846

1. Locate the relay. Refer to the *Master Electrical Component List on page 11-343* to locate the relay in the vehicle.
2. Remove any fasteners which hold the relay in place.
3. Remove any connector position assurance (CPA) devices or secondary locks.

   Note: Use care when removing a relay in a wiring harness when the relay is secured by fasteners or tape.
4. Separate the relay (1) from the wire harness connector (2).

Installation Procedure



791846

1. Connect the relay (1) to the wire harness connector (2).
2. Install any connector position assurance (CPA) devices or secondary locks.
3. Install the relay using any fasteners or tape that originally held the relay in place.

Relay Replacement (Within an Electrical Center)

Special Tools

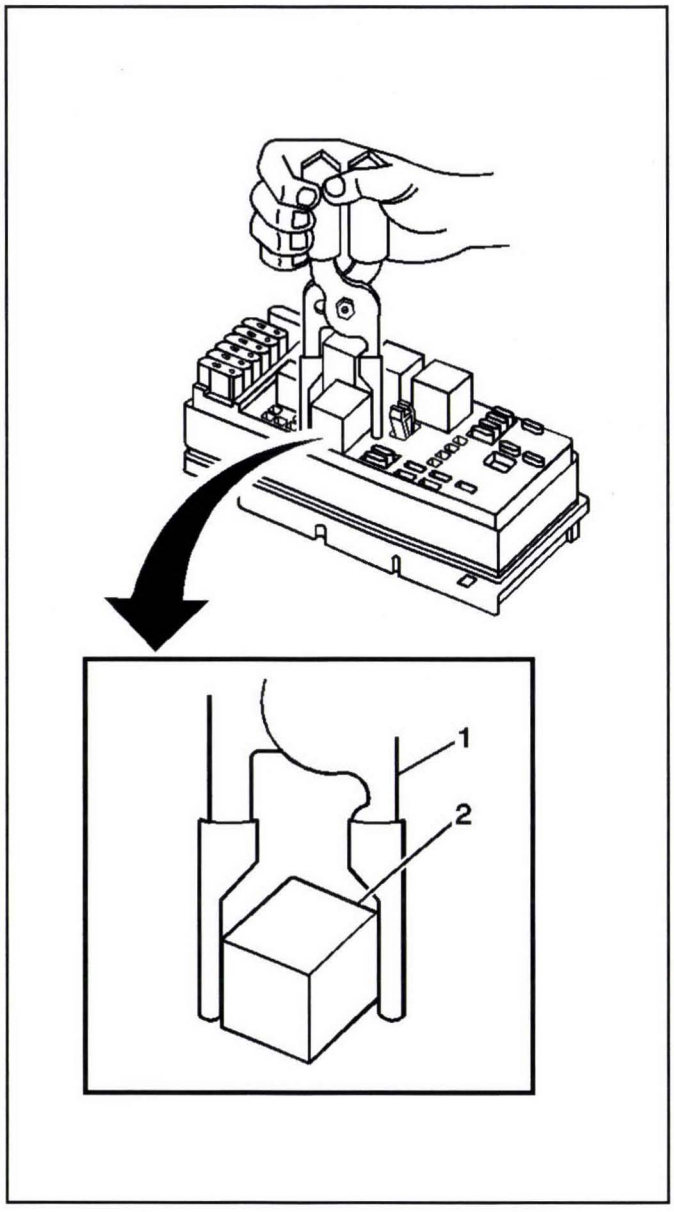
EL-43244 Relay Puller Pliers

Removal Procedure

1. Remove the electrical center cover.

   Note:

   - Always note the orientation of the relay.
   - If equipped with a notch style relay; observe the location of the notch on the old relay to verify the new relay is installed with the notch in the same location.
   - Ensure that the electrical center is secure, as not to put added stress on the wires or terminals.
2. Locate the relay. Refer to *Electrical Center Identification Views on page 11-430* to locate the electrical center where the relay exists.



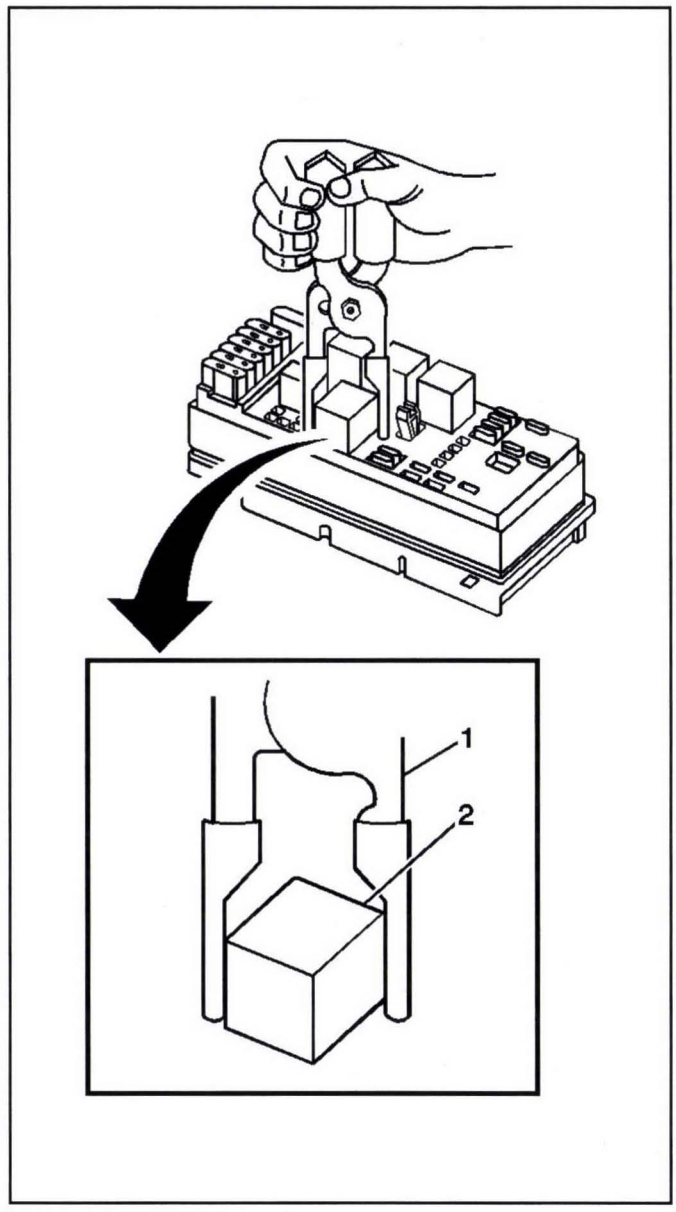
786629

3. Using the EL-43244 (1) position the tool on opposing corners of the relay (2).

Caution: Use *EL-43244* to pull the relay straight out from the electrical center terminals. The use of pliers or a flat bladed tool could damage the electrical center.

4. Remove the relay (2) from the electrical center.

Installation Procedure



786629

1. Install the relay (2) in the same position as removed.
2. Install the electrical center cover.

Ground Repair

Electrical Grounds

Proper electrical system function relies on secure, positive, corrosion-free ground connections. Loose, stripped, or corroded connections increase the possibility of improper system function and loss of module communication. These conditions may also lead to unnecessary repairs and component replacements.

In general, electrical ground connections are accomplished using one, or a combination of, three attachment methods:

- Welded M6 stud and nut

- Welded M6 nut and bolt
- Welded M8 nut and bolt

Caution: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

Determine which attachment method is used, and carry out the appropriate repair.

M6 Weld Stud Replacement

1. Select a location adjacent the damaged or missing M6 ground stud having 20 mm (0.79 in) clearance behind the panel surface and 20 mm (0.79 in) clearance surrounding the M6 rivet stud flange.
2. Using GM approved residue-free solvent or equivalent, remove any grease from the repair site and allow to dry.

   Note: Ensure 20 mm (0.79 in) clearance is maintained behind the panel to be drilled.
3. Drill a 10 mm (0.40 in) diameter hole through the panel.
4. Carefully remove paint and primer from the area surrounding the rivet stud flange until bare metal is visible.

Caution: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

5. Select a replacement conductive M6 rivet stud. Refer to GM parts catalog for the correct part number and application.
6. Using a rivet stud installer, install the replacement conductive M6 rivet stud.
7. Ensure the new rivet stud is securely fastened, with no detectable movement.

   Note: The rivet stud and surrounding panel area must be properly refinished prior to the installation of the ground terminal and nut to maintain positive electrical grounding.
8. Completely wrap the threads of the rivet stud with painters tape or equivalent.
9. Refinish the repair area using an anti-corrosion primer.
10. Allow the refinished repair area to cure sufficiently before removing the protective material applied to the rivet stud threads.
11. Remove the painters tape or equivalent from the rivet stud threads.
12. Using GM approved residue-free solvent or equivalent, thoroughly clean the rivet stud threads to remove any adhesive and allow to dry.
13. Carefully remove any corrosion from the electrical ground wire terminal. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.
14. Using a small brush, apply Dielectric Lubricant GM P/N 12377900 (Canadian P/N 10953529) to the new conductive M6 rivet stud threads.
15. Install the ground terminal to the new rivet stud.
16. Select a new, conductive M6 nut. Refer to GM parts catalog for the correct part number and application.

Caution: Refer to *Fastener Caution on page 0-8*.

17. Install the M6 nut and tighten to **8** N•m **(71 lb in)**.
18. Check for proper system operation.

M6 Weld Nut

Caution: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

1. If the M6 weld nut at the electrical ground location is damaged or stripped, a new, conductive self-threading M7 bolt may be used to secure the ground terminal. Refer to GM parts catalog for the correct part number and application.
2. Using GM approved residue-free solvent or equivalent, remove any grease from the surface surrounding the weld nut and allow to dry.
3. Remove any loose metal particles from the damaged or stripped weld nut with a stiff brush.
4. Using a small brush, apply Dielectric Lubricant GM P/N 12377900 (Canadian P/N 10953529) to the new, conductive, self-threading M7 bolt threads.
5. Carefully remove any corrosion from the electrical ground terminal. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.
6. Install the electrical ground terminal to the new, conductive M7 bolt.

Caution: Refer to *Fastener Caution on page 0-8*.

7. Install the M7 bolt and tighten to **9** N•m **(80 lb in)**.
8. Check for proper system operation.

M6 Weld Nut (Alternative Repair)

Caution: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

1. If the electrical ground location is accessible from both sides of the panel, a conductive M6 bolt and a conductive M6 nut may be used to secure the electrical ground terminal. Refer to GM parts catalog for the correct part number and application.
2. Select a location adjacent the damaged M6 weld nut having 20 mm (0.79) clearance behind the panel surface and 20 mm (0.79 in) clearance surrounding the new electrical ground site.
3. Using GM approved residue-free solvent or equivalent, remove any grease from the surface surrounding the ground location and allow to dry.

   Note: Ensure 20 mm (0.79 in) clearance is maintained behind the panel to be drilled.
4. Drill a 10 mm (0.40 in) diameter hole through the panel.
5. Carefully remove paint and primer from the area surrounding the new ground site until bare metal is visible.
6. Using a small brush, apply Dielectric Lubricant GM P/N 12377900 (Canadian P/N 10953529) to the new, conductive M6 bolt threads.
7. Carefully remove any corrosion from the electrical ground terminal. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.
8. Install the electrical ground terminal and new, conductive M6 bolt to the ground location.

Caution: Refer to *Fastener Caution on page 0-8*.

9. Install the conductive M6 nut and tighten to **8** N•m **(71 lb in)**.

Note: The repair area must be properly refinished to maintain positive electrical grounding.

10. Refinish the repair area using an anti-corrosion primer.
11. Check for proper system operation.

M8 Weld Nut

Caution: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

1. If the M8 weld nut electrical ground location is accessible from both sides of the panel, a conductive M8 bolt and a conductive M8 nut may be used to secure the ground terminal. Refer to GM parts catalog for the correct part numbers and application.
2. Select a location adjacent to M8 weld nut having 20 mm (0.79 in) clearance behind the panel surface and 20 mm (0.79 in) clearance surrounding the new electrical ground site.
3. Using GM approved residue-free solvent or equivalent, remove any grease from the surface surrounding the ground location and allow to dry.

   Note: Ensure 20 mm (0.79 in) clearance is maintained behind the panel to be drilled.
4. Drill a 10 mm (0.40 in) diameter hole through the panel.
5. Carefully remove paint and primer from the area surrounding the new ground site until bare metal is visible.
6. Using a small brush, apply Dielectric Lubricant GM P/N 12377900 (Canadian P/N 10953529) to the new, conductive M8 bolt threads.
7. Carefully remove any corrosion from the electrical ground terminal. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.
8. Install the electrical ground terminal and new, conductive M8 bolt to the ground location.

Caution: Refer to *Fastener Caution on page 0-8*.

9. Install the conductive M8 nut and tighten to **22** N•m **(16 lb ft)**.

   Note: The repair area must be properly refinished to maintain positive electrical grounding.
10. Refinish the repair area using an anti-corrosion primer.
11. Check for proper system operation.

M8 Weld Nut (Alternative Repair)

Caution: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

1. If the M8 weld nut electrical ground location is not accessible from both sides of the panel, a conductive M6 rivet stud and a conductive M6 nut may be used to secure the ground terminal. Refer to GM parts catalog for the correct part numbers and application.
2. Select a location adjacent the damaged M8 weld nut having 20 mm (0.79 in) clearance behind the panel surface and 20 mm (0.79 in) clearance surrounding the new, conductive M6 rivet stud flange.
3. Using GM approved residue-free solvent or equivalent, remove any grease from the repair site and allow to dry.

   Note: Ensure 20 mm (0.79 in) clearance is maintained behind the panel to be drilled.
4. Drill a 10 mm (0.40 in) diameter hole through the panel.
5. Carefully remove paint and primer from the area surrounding the rivet stud flange until bare metal is visible.
6. Using a rivet stud installer, install the replacement conductive M6 rivet stud.
7. Ensure the new rivet stud is securely fastened, with no detectable movement.

   Note: The rivet stud and surrounding panel area must be properly refinished prior to the installation of the ground terminal and nut to maintain positive electrical grounding.
8. Completely wrap the threads of the rivet stud with painters tape or equivalent.
9. Refinish the repair area using an anti-corrosion primer.
10. Allow the refinished repair area to cure sufficiently before removing the protective material applied to the rivet stud threads.
11. Remove the painters tape or equivalent from the rivet stud threads.
12. Using GM approved residue-free solvent or equivalent, thoroughly clean the rivet stud threads to remove any adhesive and allow to dry.
13. Carefully remove any corrosion from the electrical ground wire terminal. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.
14. Using a small brush, apply Dielectric Lubricant GM P/N 12377900 (Canadian P/N 10953529) to the new conductive M6 rivet stud threads.
15. Install the ground terminal to the new, conductive M6 rivet stud.

Caution: Refer to *Fastener Caution on page 0-8*.

16. Install the conductive M6 nut and tighten to **8** N•m **(71 lb in)**.
17. Check for proper system operation.

Securing Loose Electrical Ground Connections

If the electrical ground connection is loose and the ground attachments are not damaged, properly securing the loose electrical ground may be all that is necessary. Carry out the following procedure to secure loose electrical ground connections.

Caution: Use GM approved replacement fasteners with conductive finish for electrical ground repair.

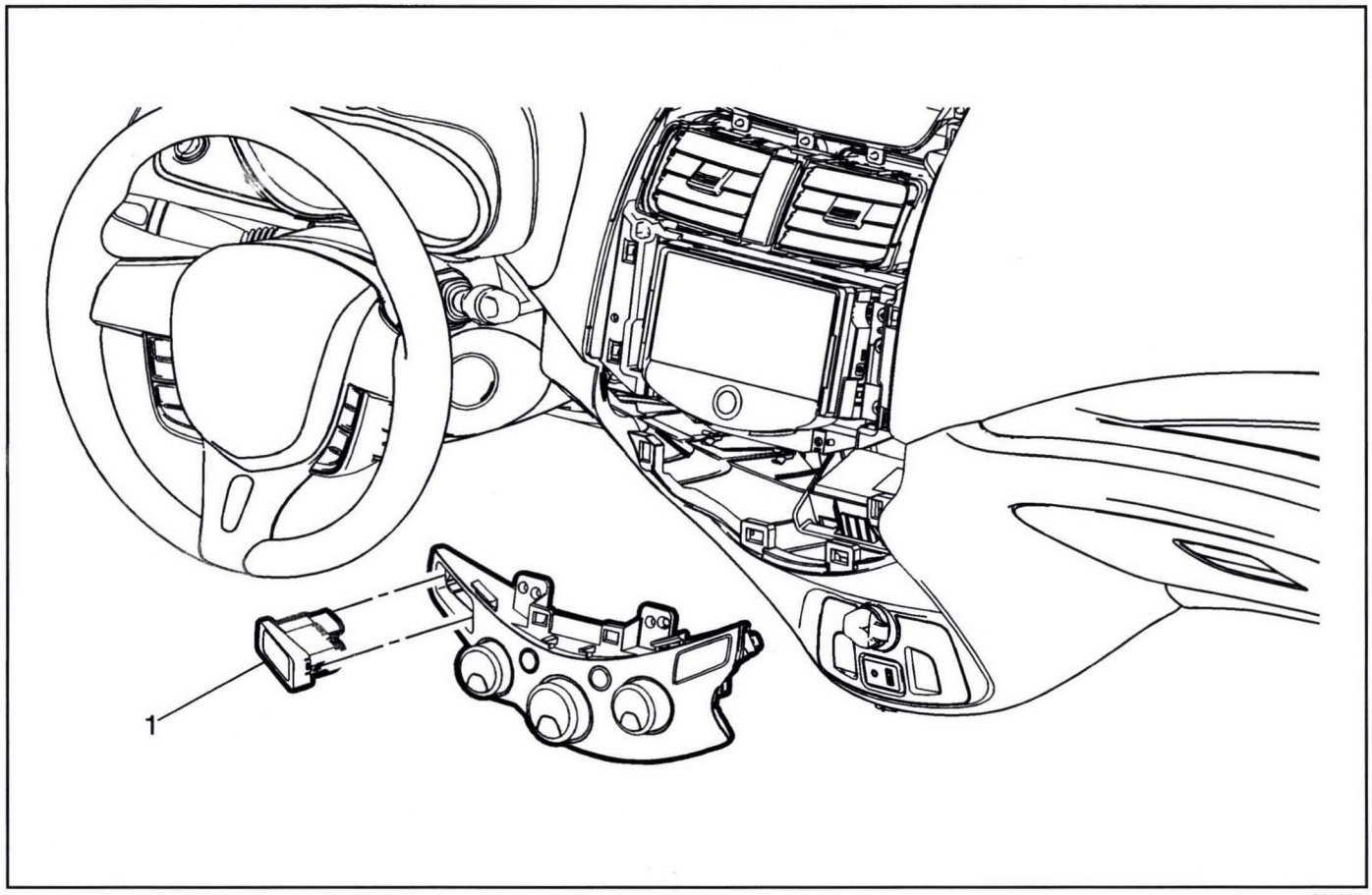
1. Using GM approved residue-free solvent or equivalent, thoroughly clean the ground stud threads and allow to dry.
2. Carefully remove any corrosion from the electrical ground wire terminal. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.

3. Using a small brush, apply Dielectric Lubricant GM P/N 12377900 (Canadian P/N 10953529) to the ground stud threads.
4. Install the ground wire terminal to the ground stud.

Caution: Refer to *Fastener Caution on page 0-8*.

5. Install the ground stud nut.
   - M6 ground stud nut: Tighten to **9** N•m **(80 lb in)**
   - M8 ground stud nut: Tighten to **22** N•m **(16 lb ft)**
   - M10 ground stud nut: Tighten to **45** N•m **(33 lb ft)**
6. Check for proper system operation.

Ignition and Start Switch Replacement



3212611

Ignition and Start Switch Replacement

Callout	Component Name
Preliminary Procedure Remove the auxiliary heater and air conditioning control. Refer to *Auxiliary Heater and Air Conditioning Control Replacement on page 10-135*.	
1	Ignition and Start Switch **Procedure** Depress tabs on switch to remove from the control.

Description and Operation

Electronic Park Lock Description and Operation

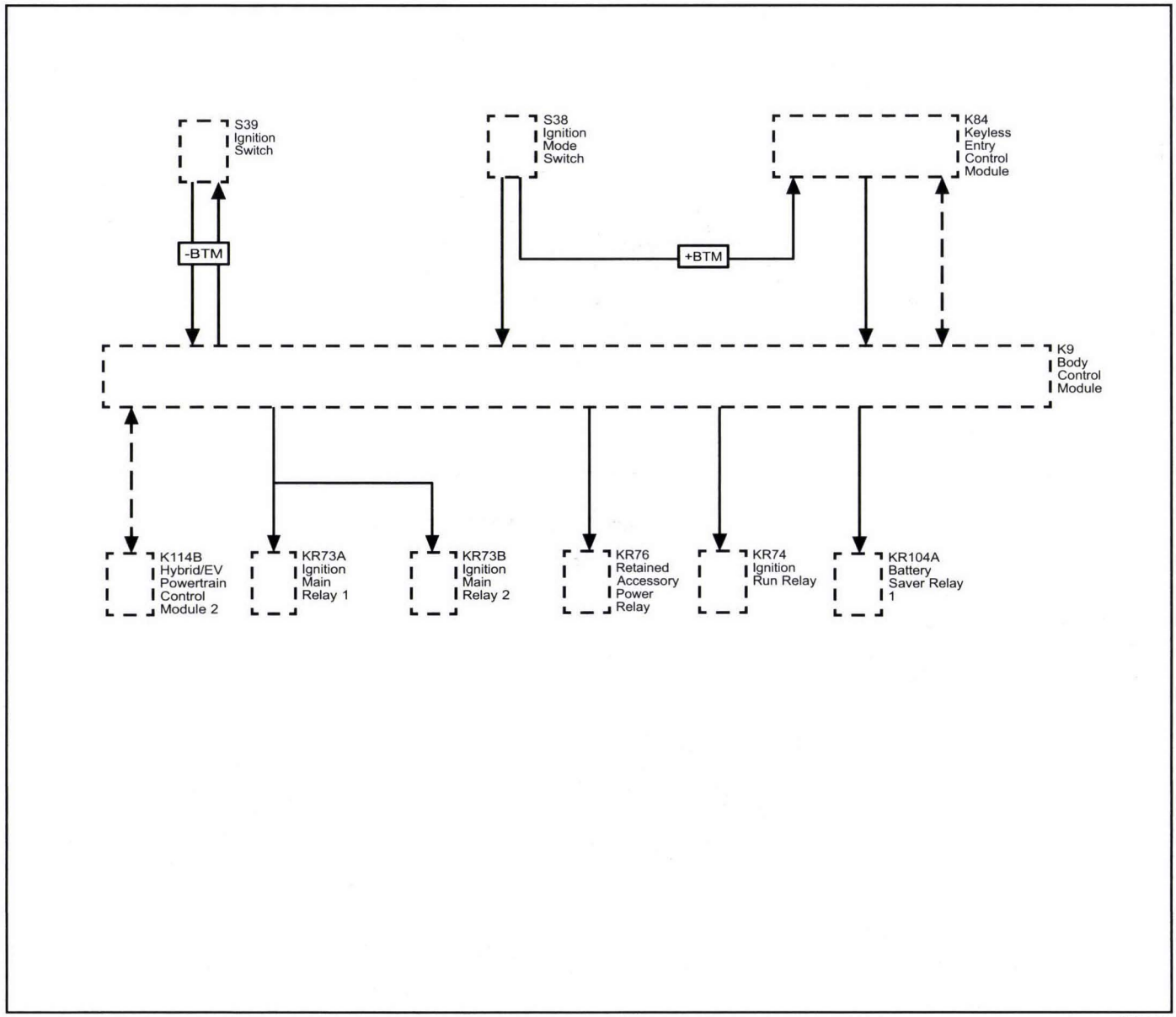
If the vehicle is equipped with automatic transmission and a floor mounted console gear shift, it has an electronic park lock system. The electronic park lock system purpose is to prevent the ignition from being switched to the OFF position when the transmission is in any position other than PARK and the vehicle may still be moving. The electronic park lock system incorporates the park position switch that located in the A/T shift lock control switch. When the transmission shift selector is in PARK, the park position switch closes and the BCM allows the ignition to be turned OFF.

If the vehicle is not in PARK, the ignition will return to ACC/ACCESSORY and display the message SHIFT TO PARK in the Driver Information Center. When the vehicle is shifted into PARK, the ignition system will switch to OFF.

Power Mode Description and Operation

Serial Data Power Mode Master

Power Moding D&O Block Diagram



3618100

Power to many of this vehicles circuits is controlled by the module that is designated the power mode master. This vehicles power mode master is the body control module (BCM). The BCM has multiple B+ circuits that feed into it. Each of those circuits are partitioned within the controller to drive certain outputs of the vehicle's body functions. An open or short in any one of the B+ circuits may induce multiple codes/or a section of non-functionality within the BCM with the rest of the BCM functioning normally. In this case it is useful to refer to the power distribution schematics to determine if the non-functional partition of the controller shares a common B+ circuit. The power button switch is a low current push button switch with discrete power button switch signals to the power mode master for determination of the power mode that will be sent over the serial data circuits to the other modules that need this information. The power mode master will also activate relays and other direct outputs of the power mode master as needed. The power mode master determines which power mode (Vehicle Off, Vehicle On, Vehicle in Service Mode) is required, and reports this information to other modules via serial data. Modules which have switched voltage inputs may operate in a default mode if the power mode serial data message does not match what the individual module can see from its own connections.

The power mode master receives ignition switch or power button switch signals and transmitter in range signals to identify the operators desired power mode. The Power Mode Parameters in the tables below illustrate the correct state of these input parameters (circuits) in correspondence to the ignition switch or power button switch position with the transmitter to vehicle range:

Power Mode Parameters (Without BTM)

Ignition Switch Position	Power Mode Transmitted	Ign. Off/Run/Crank (Off/Run Crank Voltage Circuit)	Ignition Accessory/Run (Accessory Voltage Circuit)	Ignition Run/Crank (Ignition 1 Voltage Circuit)
Off Key Out	Vehicle Off	Key Out / ACC	Inactive	Inactive
Off Key IN	Vehicle Off	Key In / Off	Inactive	Inactive
Accessory	Vehicle Off	Key Out / ACC	Active	Inactive
Run	Vehicle in Service Mode	Run	Active	Active
Vehicle Off Power Mode, then turn the ignition to the Start position for 5 s with the foot on the Brake (Pedal)	Vehicle On	Crank	Inactive	Active

Power Mode Parameters (With BTM)

Power Mode	Power Mode Transmitted	Push Button Ignition Switch (Power Button Switch Circuit Input to the BCM)	Push Button Ignition Switch Voltage Push Button Ignition Switch Voltage Input to the BCM	Key in Cylinder Switch/Key Fob in Vehicle (Transmitter in Range to the BCM Signal)
Transmitter in Range	Vehicle Off	Inactive	9 V	Yes
Transmitter out of Range	Vehicle Off	Inactive	9 V	No
Vehicle On Power Mode, then Press the Power Button Switch (Foot on or off the Brake Pedal) Transmitter in Vehicle	Vehicle Off	Active (pushed) / Inactive (not pushed)	6 V (pressed)	Yes
Vehicle Off Power Mode, then Press the Power Button Switch with foot on the Brake Pedal; Transmitter in Vehicle	Vehicle On	Active (pushed) / Inactive (not pushed)	6 V (pressed)	Yes

Power Mode Parameters (With BTM) (cont'd)

Power Mode	Power Mode Transmitted	Push Button Ignition Switch (Power Button Switch Circuit Input to the BCM)	Push Button Ignition Switch Voltage Push Button Ignition Switch Voltage Input to the BCM	Key in Cylinder Switch/Key Fob in Vehicle (Transmitter in Range to the BCM Signal)
Vehicle Off Power Mode, then Press and Hold the Power Button Switch for over 5 s with foot off the Brake Pedal; Transmitter in Vehicle	Vehicle in Service Mode	Active (pushed) / Inactive (not pushed)	6 V (pressed)	Yes
Vehicle Off Power Mode, then Press and Hold the Power Button Switch for over 10 s with foot off the Brake Pedal; Transmitter in Vehicle	Vehicle in Service Mode	Active (pushed) / Inactive (not pushed)	6 V (pressed)	Yes

Relay Controlled Power Mode (Without BTM)

The BCM uses discrete ignition switch inputs Off/Ruin/Crank Voltage, Accessory Voltage, and Ignition 1 Voltage, to distinguish the correct power mode. The BCM, after determining the desired power mode, will activate the appropriate relays for that power mode.

The retained accessory power relay remains on for a timed period after the power mode transitions to Vehicle Off. Refer to *Retained Accessory Power Description and Operation on page 11-962* for more information on the retained accessory power function.

Relay Controlled Power Mode (With BTM)

The BCM uses the discrete power button switch inputs, transmitter in range status, current power mode state, and the brake pedal position state to distinguish the correct power mode (Vehicle Off, Vehicle On, and Vehicle in Service Mode). The BCM, after determining the desired power mode, will activate the appropriate relays for that power mode and send the power mode message out to other modules in a serial data message.

The retained accessory power relay remains on for a timed period after the power mode transitions to Vehicle Off. Refer to *Retained Accessory Power Description and Operation on page 11-962* for more information on the retained accessory power function.

Push Button Start (If Equipped)

The vehicle has an electronic push button start switch . The power button switch is equipped with two blue LED's, one for backlighting and one for Vehicle On indication or Vehicle In Service Mode indication. The power button switch light flashes when the driver door is open and the vehicle is not on. The flashing light will eventually time out. The power button switch light is on steady when in Vehicle On or Vehicle In Service Mode. When the vehicle is turned off, the power button switch light will turn off.

The vehicle ON/OFF switch contains two individual switches that provides redundant switch inputs to both the BCM and the keyless entry control module. The BCM supplies the vehicle ON/OFF switch a constant B + signal. The BCM monitors this signal to determine if the switch is released or pressed. When the vehicle ON/OFF switch is not pressed, voltage on the signal circuit is pulled down through two resistors in the switch. When the vehicle ON/OFF switch is pressed, voltage on the signal circuit is pulled down through only one resistor, changing the voltage seen at the BCM and indicating that the vehicle ON/OFF switch is pressed.

The keyless entry control module monitors voltage on the switch in the same manner as the BCM, but monitors the second switch located in the vehicle ON/OFF switch. The keyless entry control module also controls the backup power for the ignition main relay through the control circuit by applying voltage to the ignition voltage circuit. This circuit is a pass-thru in the BCM and will energize the ignition circuit when the vehicle is in Service Mode, the vehicle is ON, or when a remote start is requested.

Vehicle On

This position is for driving and starting. The Vehicle On mode will be used for service and diagnostics on the electronic propulsion system. With the vehicle off, and the brake pedal applied, pressing the power button switch once or turning the ignition switch to the start position will place the vehicle in Vehicle On mode. The instrument cluster displays an active battery gauge, along with an audio startup cue, when the vehicle is ready to be driven. This could take up to 15 seconds at extremely cold temperatures. If the vehicle did not start, the instrument cluster will display a screen with an inactive battery gauge. The electric propulsion system is active in this power mode. The vehicle can be charged while in this power mode. If the vehicle is left in PARK while in Vehicle On mode and the transmitter is removed from the vehicle, the vehicle will automatically turn off after 2.5 hours. If the vehicle is left in PARK while in Vehicle On mode and the transmitter is in the vehicle, the vehicle will automatically turn OFF after

5 hours. The timer will stop when the vehicle is shifted out of PARK and the timer will reset after the vehicle is placed back in PARK while in Vehicle On mode.

Vehicle In Service Mode

Note: The vehicle will not charge if the charging cable is attached to the vehicle after being placed into the Vehicle In Service Mode. Attach the charging cable to the vehicle before entering the Vehicle In Service Mode to charge the vehicle.

This power mode is available for service and diagnostics, and to verify the proper operation of the MIL as may be required for emission inspection purposes. The Vehicle In Service Mode will be used for service and diagnostics for items not requiring the electronic propulsion to be active. With the vehicle off, and the brake pedal not applied, pressing and holding the power button switch for 5 s will place the vehicle in Vehicle In Service Mode for approximately 5 hours. After being in Vehicle In Service Mode for 2.5 hours, the vehicle will look to see if the transmitter in still present. If the transmitter is not present in the vehicle, it will power down instead of staying powered up for the full 5 hours. Pressing and holding the power button switch for 10 s or turning the ignition switch to the run position will place the vehicle in Vehicle In Service Mode until the vehicle is manually turned OFF. The instruments and audio systems will operate as they do in Vehicle On mode, but the vehicle will not be able to be driven. The electric propulsion system is inactive in this power mode.

Vehicle Off

To turn the vehicle OFF, push the power button switch or turn the ignition switch to the OFF position with the vehicle in P (Park). Retained Accessory Power (RAP) will remain active until the driver door is opened. Refer to *Retained Accessory Power Description and Operation on page 11-962* for more information on the retained accessory power function. When turning off the vehicle, if the vehicle is not in P (Park), the SHIFT TO PARK message is displayed in the Driver Information Center (DIC). The electric propulsion system is inactive in this power mode.

Battery Saver Mode (Transport Mode) (If Equipped)

Battery saver mode (transport mode) reduces the parasitic load of some modules during overseas shipment or during vehicle storage conditions. This improves the drain time on the battery (up to 70 days without the battery going dead). When a vehicle is in transport/storage, some features may have reduced functionality while in the battery saver mode, such as disabling the Remote Function Actuator or content theft features. Battery saver mode is initiated by turning on the hazard flashers, applying the brake pedal, and then turning the ignition key to the start position or pushing the power button switch for greater than 15s. The mode is disengaged by repeating the previous process. The DIC (if equipped) will display Transport Mode is On when battery saver mode is enabled and Transport Mode is Off when battery saver mode is disabled. For vehicles not equipped with a DIC, the battery indicator light will constantly flash on the Instrument Cluster when battery saver mode is enabled. This feature can be used as many times as necessary if the vehicle is to be stored for an extended period of time.

Battery saver mode incorporates a latching relay that when enabled disconnects some modules from their ignition power or memory power sources. When battery saver mode is enabled and the vehicle is switched to Vehicle OFF, the BCM sends a momentary command to unlatch the relay disconnecting power up to 1 min after RAP is inactive. Every time the vehicle is switched to Vehicle ON or to Vehicle in Service Mode the BCM will send a momentary command to latch the battery saver relay. This allows the use of all features when in Vehicle ON or Vehicle in Service Mode. The BCM will send another command to unlatch the relay once the vehicle is switched to Vehicle OFF and RAP is inactive.

BCM Awake/Sleep States

The BCM is able to control or perform all of the BCM functions in the awake state. The BCM enters the sleep state when active control or normal monitoring of system functions has stopped and a time limit has passed. The BCM must detect certain wake-up inputs before entering the awake state. The BCM monitors for these inputs during the sleep state.

The BCM will enter the awake state if any of the following wake-up inputs are detected:

- Activity on the serial data line (including wake-up circuits)
- Detection of a battery reconnect
- Any door open signal
- Headlamps ON
- Key-in-ignition
- Vehicle On
- Vehicle In Service Mode
- Park lamps ON
- Keyless entry or remote start message

The BCM will enter a sleep state when all of the following conditions exist:

- Vehicle Off, transmitter is out of range
- The ignition switch is OFF, key out.
- No activity exists on the serial data line (including wake-up circuits)
- No outputs are commanded.
- No delay timers are actively counting.
- No wake-up inputs are present.

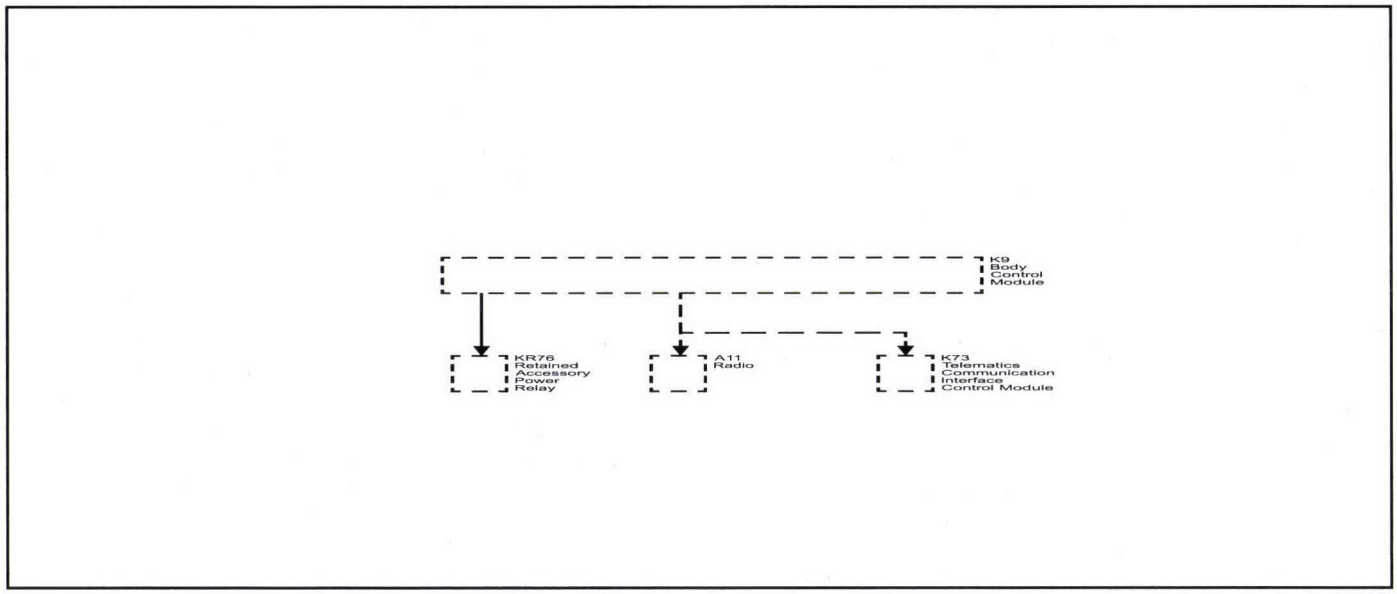
If all these conditions are met, the BCM will enter a low power or sleep condition.

Serial Data Wake-Up

Control modules on the serial data wake-up circuit enable or disable communication based on the voltage level of this circuit.

Retained Accessory Power Description and Operation

RAP Description and Operation Block Diagram



3275532

Retained Accessory Power

The body control module (BCM) monitors the vehicle power modes, battery condition, and each door ajar/ open switch status to determine whether the retained accessory power should be initiated or terminated. Retained accessory power is controlled by two different methods; relay control and serial data. Some modules receive a retained accessory power message from the BCM over the serial data circuits. Serial data controlled retained accessory power is deactivated as required by their modules retained accessory power mode operation. Other subsystems are activated directly by the BCM through a relay. Components and systems that are active in retained accessory power are also activated anytime the vehicle power mode is any state other than Vehicle OFF regardless of the door switch signals.

Relay Controlled Retained Accessory Power

The BCM keeps the relay energized during all power modes, except Vehicle Off. The relay is also energized for approximately 10 minutes after moving to the Vehicle OFF state and moving the transmitter out of range, providing no door is opened.

Relay controlled retained accessory power will end when one of the following conditions is met:

- The BCM receives an input from any door ajar or open switch indicating the opening of any door after entering the Vehicle Off state and the transmitter is out of range.

  Note: If the BCM is receiving any door ajar or open signal from those switches when the Vehicle Off state is entered and the transmitter is out of range, retained accessory power will not initiate.

- The BCM internal timer for the retained accessory power expires after approximately 10 minutes.
- The BCM detects a decrease in battery capacity below a prescribed limit.

Systems powered by the accessory relay during the retained accessory power mode are as follows:

Note: The vehicle may not be equipped with all components as listed below.

- Accessory Power Receptacle
- Cigarette Lighter Receptacle
- Window Switches
- Sunroof Control Module
- Sunroof Switch
- Mobile Device Wireless Charger Module
- Mobile Telephone Control Module
- Traffic Data Receiver
- Transmission Shift Lever Position Indicator (w/ floor mounted console gear shift)
- Seat Heating Control Module

Serial Data Controlled Retained Accessory Power

Retained accessory power systems controlled by serial data are as follows:

Radio

Radio retained accessory power activation / termination is the same as relay operation with one exception; the only door switch that will turn off the radio during retained accessory power is the driver door open switch.

Vehicle Communication Interface Module (VCIM) (Onstar®) (If Equipped)

VCIM RAP activation/termination is the same as radio operation with 1 exception; if there is an active call when the ignition key is turned off the VCIM will remain in RAP mode, and keep the radio in RAP mode until the call is terminated.

Special Tools and Equipment

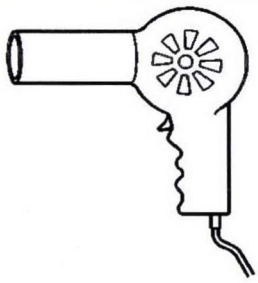
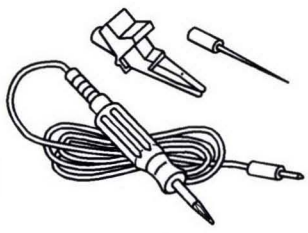
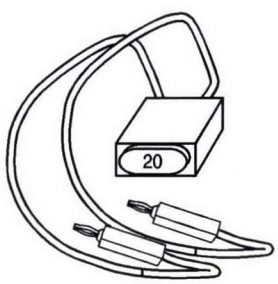
Illustration	Tool Number / Description
 78337	EL-25070 EL-38125-5A EL-38125-5 J-38125-5A Heat Gun 500–700 F
 8917	EL-35616 KM-609 Tyco Electronic Tool (5–1579007–3) Terminal Test Probe Kit
 1338380	EL-35616-200 KM-J-34142–B Test Light– Probe Kit
 1025	EL-35616-20F KM-963 Fused Jumper Wire

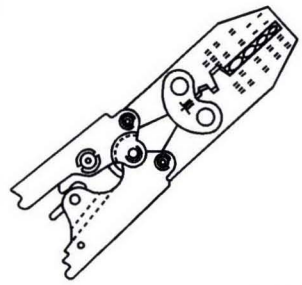
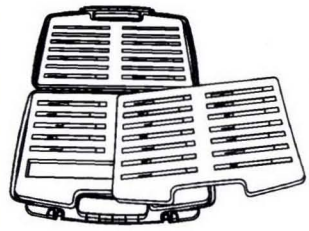
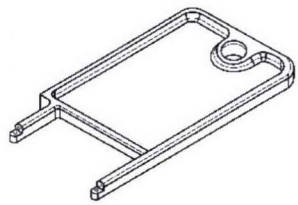
Illustration	Tool Number / Description
 2498072	EL-38125–10 (Non-North America) EL-38125–EU (Europe) J-38125-8 (North America Only) Splice Sleeve Crimp Tool
 2736016	EL-38125-550 (North America Only) Terminal Release Tool Kit
 2736019	EL-38125-580 (Non-North America) Terminal Release Tool Kit
 3430	EL-39200 Digital Multimeter
 606621	EL-42759 Ignition Switch Connector Release Tool

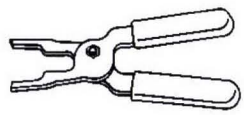
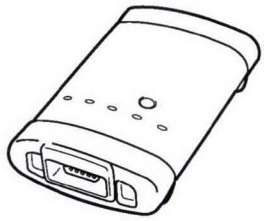
Illustration	Tool Number / Description
 696431	EL-43244 Relay Puller Pliers
 2191416	EL-47955 J-2534 Multi Diagnostic Interface MDI

Illustration	Tool Number / Description
 2736014	EL-50040 (Holden Only) Crimping Tool Kit

Section 12

Safety and Security

Immobilizer 12-3
Specifications 12-3
Fastener Tightening Specifications 12-3
Schematic and Routing Diagrams 12-3
Immobilizer Schematics 12-4
Diagnostic Information and Procedures 12-5
DTC B2955 12-5
DTC B302A 12-7
DTC B3031 12-9
DTC B3055 12-10
DTC B305C 12-12
DTC B3060 12-13
DTC B389A 12-14
DTC B3902 12-16
DTC B3935 12-17
DTC B3976 12-18
DTC B3984 12-19
DTC P0513 12-20
DTC P0633 12-21
DTC P162B 12-22
DTC P1631 12-23
DTC P1649 12-24
Symptoms - Immobilizer 12-24
OnStar Stolen Vehicle Slowdown Active 12-25
Repair Instructions 12-26
Theft Deterrent Module Replacement (With BTM) 12-26
Immobilizer System Component Programming 12-27
Key with Integrated Transmitter Programming 12-28
Hood Ajar Indicator Switch Replacement 12-31
Description and Operation 12-32
Immobilizer Description and Operation 12-32
Remote Vehicle Speed Limiting Description and Operation 12-34

Object Detection and Pedestrian Protection 12-35
Schematic and Routing Diagrams 12-35
Object Detection Schematics 12-36
Diagnostic Information and Procedures 12-39
DTC B010E 12-39
DTC B1015 12-41
Symptoms - Object Detection 12-41
Parking Assist System Malfunction 12-42
Pedestrian Alert System Malfunction 12-44
Rear Vision Camera System Malfunction 12-46
Repair Instructions 12-48
Pedestrian Sound Alert Module Replacement 12-48
Pedestrian Sound Alert Speaker Replacement 12-49
Parking Assist Control Module Replacement 12-50
Rear Parking Assist Alarm Sensor Replacement 12-51
Rearview Camera Image Display Module Replacement 12-52
Description and Operation 12-52
Object Detection Description and Operation (with park assist, UD7) 12-52
Object Detection Description and Operation (with rearview camera, UVC) 12-53

Remote Functions 12-54
Specifications 12-54
Fastener Tightening Specifications 12-54
Schematic and Routing Diagrams 12-54
Remote Function Schematics 12-55
Diagnostic Information and Procedures 12-57
DTC B3101 12-57
DTC B3105 12-59
DTC B3106 12-60
DTC B3109-B3113 12-61
DTC B310D-B310F 12-62
DTC B3122 12-63
DTC B3123 12-65
Symptoms - Remote Functions 12-66
No Remote Detected 12-67
Keyless Entry System Malfunction 12-69
Remote Vehicle Start Malfunction 12-71
Repair Instructions 12-73
Ignition Lock Key Transmitter Antenna Replacement - Floor Console 12-73
Ignition Lock Key Transmitter Antenna Replacement - Rear Compartment 12-74
Ignition Lock Key Transmitter Antenna Bracket Replacement 12-75
Keyless Entry Control Module Replacement 12-76

Keyless Entry Control Module Bracket Replacement 12-77
Remote Control Door Lock Receiver Replacement 12-78
Description and Operation 12-79
Keyless Entry System Description and Operation 12-79

Seat Belts 12-81
Specifications 12-81
Fastener Tightening Specifications 12-81
Schematic and Routing Diagrams 12-81
Seat Belt Schematics 12-82
Diagnostic Information and Procedures 12-85
DTC B0082 12-85
Symptoms - Seat Belts 12-86
Seat Belt Does Not Retract 12-87
Seat Belt Indicator Malfunction - Driver 12-87
Seat Belt Indicator Malfunction - Passenger ... 12-89
Repair Instructions 12-92
Passenger Seat Belt Front Passenger Presence Sensor Replacement (Korea) 12-92
Repairs and Inspections Required After a Collision 12-93
Seat Belt Latch Stop Installation 12-93
Front Seat Belt Buckle Replacement 12-94
Rear Seat Belt Buckle Replacement 12-95
Front Seat Belt Guide Adjuster Replacement 12-96
Rear Seat Belt Retractor Replacement 12-97
Description and Operation 12-98
Seat Belt System Description and Operation 12-98

Supplemental Inflatable Restraints 12-100
Specifications 12-100
Fastener Tightening Specifications 12-100
Schematic and Routing Diagrams 12-100
SIR Schematics 12-101
Diagnostic Information and Procedures 12-105
DTC B0012 or B0013 12-105
DTC B0014, B0021, B0031, or B0038 12-109
DTC B0015, B001A, B001B, or B0022 12-113
DTC B0016, B0018, B0023, or B0025 12-117
DTC B0017 or B0024 12-120
DTC B0019 or B0020 12-123
DTC B0052 12-127
DTC B0071 12-128
DTC B0074 12-130
DTC B0081 12-132
DTC B0083-B0088 12-135
DTC B0091 12-139
DTC B0098 12-142
DTC B1001 12-144
DTC B1019 12-145
Passenger Presence System Rezeroing 12-147
Symptoms - SIR 12-147
Airbag Indicator Malfunction (Driver) 12-147
Airbag Indicator Malfunction (Passenger) 12-149
SIR Disabling and Enabling 12-151
Repair Instructions 12-152
SIR Service Precautions 12-152
Instrument Panel Lower Airbag Bracket Replacement 12-153
Airbag Front End Discriminating Sensor Replacement 12-154
Airbag Sensing and Diagnostic Module Replacement 12-155
Steering Wheel Airbag Replacement 12-155
Steering Wheel Airbag Coil Replacement 12-158
Airbag Steering Wheel Module Coil Centering 12-158
Instrument Panel Airbag Replacement 12-159
Instrument Panel Lower Airbag Replacement - Driver Side 12-160
Instrument Panel Lower Airbag Replacement - Passenger Side 12-161
Airbag Front Passenger Presence Module Replacement 12-162
Front and Rear Row Seat Roof Rail Airbag Replacement 12-163
Front Seat Outboard Seat Back Airbag Replacement 12-164
Rear Seat Bolster Airbag Replacement 12-165
Airbag Side Impact Center Pillar Sensor Replacement 12-166
Airbag Side Impact Sensor Replacement - Front Side Door 12-168
Inflatable Restraint Instrument Panel Compartment Module Disable Switch Replacement 12-169
Front Seat Belt Anchor Plate Tensioner Replacement 12-170
Driver or Passenger Seat Retractor Side Belt Replacement 12-171
Repairs and Inspections Required After a Collision 12-172
Inflatable Restraint Module Handling and Scrapping 12-173
Pretensioner Handling and Scrapping 12-179
Description and Operation 12-182
Supplemental Inflatable Restraint System Description and Operation 12-182
Special Tools and Equipment 12-184

Theft Deterrent 12-185
Schematic and Routing Diagrams 12-185
Theft Deterrent System Schematics 12-186
Diagnostic Information and Procedures 12-187
Symptoms - Theft Deterrent 12-187
Content Theft Deterrent Malfunction 12-187
Security Indicator Malfunction 12-188
Description and Operation 12-189
Theft Systems Description and Operation ... 12-189

Immobilizer

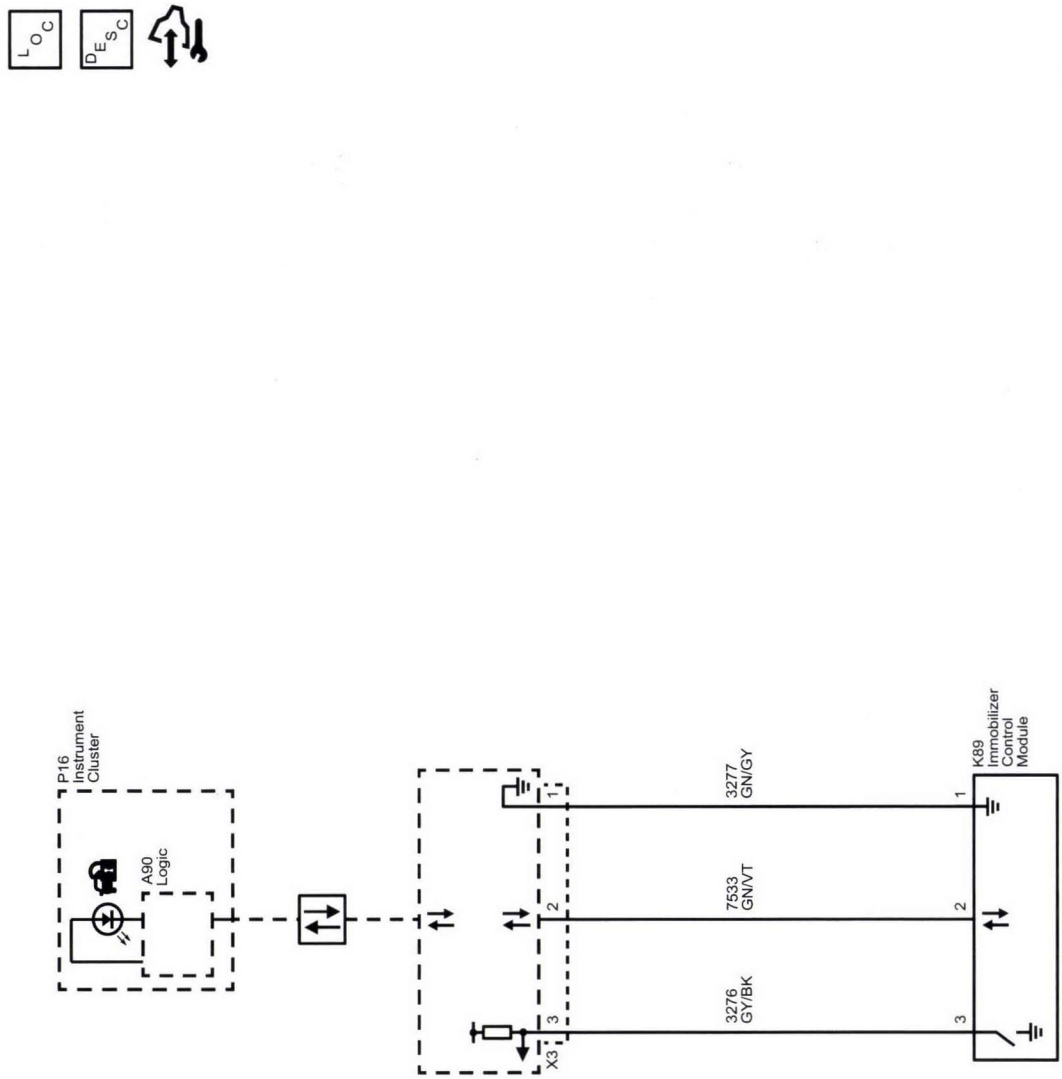
Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Theft Deterrent Module Screw	3 N•m	27 lb in

Schematic and Routing Diagrams

Immobilizer Schematics (Immobilizer)



Diagnostic Information and Procedures

DTC B2955

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B2955 00: Security Sensor Data Circuit Malfunction

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	B2955 00	B2955 00	—	—
Serial Data	B2955 00	B2955 00	B2955 00	B2955 00
Low Reference	—	B2955 00	—	—

Circuit/System Description

When a keyless entry transmitter is inserted into the transmitter pocket/slot and the ignition mode switch is pressed, the transponder embedded in the transmitter is energized by the immobilizer antenna exciter coil. The transponder transmits a signal to the body control module (BCM). The BCM then compares this value to a value stored in memory. If the value is correct, the BCM will send the prerelease password via the serial data circuit to the engine control module (ECM). If the learned key code does not match or a transponder value is not received, the BCM will send the start disable password to the ECM.

Conditions for Running the DTC

Vehicle is ON or in Service Mode.

Conditions for Setting the DTC

The BCM detects a circuit fault on the immobilizer antenna circuits.

Action Taken When the DTC Sets

- Vehicle starting will be disabled.
- The security indicator in the instrument cluster will be illuminated. A service message will be displayed in the driver information center.

Conditions for Clearing the DTC

- A current DTC will be cleared when the condition for setting the DTC are no longer present.
- A history DTC will be cleared after 100 malfunction-free power mode cycles.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the K89 Immobilizer Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Verify a test lamp illuminates between the low reference circuit terminal 1 and B+.

⇒ **If the test lamp does not illuminate**

2.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.

2.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

3. Vehicle in Service Mode.

   Note: In some instances, the K9 Body Control Module may only apply voltage for 3 s immediately after the ignition mode switch is pressed. It may be necessary to monitor the DMM while pressing the ignition mode switch to observe the voltage.

4. Test for greater than 9 V between the ignition circuit terminal 3 and ground.

⇒ **If 9 V or less**

4.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.

4.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

4.3. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If greater than 9 V**

5. Vehicle in Service Mode.
6. Test for 12–13 V between the serial data circuit terminal 2 and ground.

⇒ **If less than 12 V**

6.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.

6.2. Test for infinite resistance between the serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If greater than 13 V**

6.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module, vehicle ON.

6.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If within 12–13 V**

7. Replace the K89 Immobilizer Control Module.
8. Verify DTC B2955 is not set.

⇒ **If DTC B2955 is set**

Replace the K9 Body Control Module.

⇓ **If DTC B2955 is not set or is set as history**

9. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for body control module or immobilizer control module replacement, programming, and setup

DTC B302A

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B302A: Mobile Telephone Communications Interface Requested Immobilization

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

As part of the vehicle telematics enhanced services, a request may be sent to the body control module (BCM) to disable vehicle starting. If a valid message is received by the BCM requesting that starting be disabled, the start enable message will not be sent to the engine control module (ECM).

Conditions for Running the DTC

The BCM continuously monitors for this DTC.

Conditions for Setting the DTC

A start disable message has been received from the telematics module.

Action Taken When the DTC Sets

Vehicle starting will be suspended and the security indicator will be illuminated.

Conditions for Clearing the DTC

- A current DTC will clear when the telematics start disable request is no longer received.
- A history DTC will clear after 100 ignition cycles in which the telematic start disable request is not seen.

Diagnostic Aids

- DTC B302A is only an indicator that a start disable request has been received from the vehicle telematics system and does not indicate a fault in the immobilizer or telematics system.
- To remove the start disable request, the vehicle account must be updated with the OnStar stolen vehicle team. This will require that a law enforcement agency or the customer contact OnStar to indicate that the vehicle has been successfully and safely recovered.
- If the OnStar system has been disabled or damage during a theft attempt, the system will not be able to communicate and the start disable request will not be removed. OnStar must be functioning properly for the start disable request to be removed.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify the OnStar system is not damaged and is operating properly, with no DTCs set.

⇒ **If the OnStar system is damaged, inoperative, or any OnStar DTCs are set**

These concerns must be corrected before the start disable can be removed.

⇓ **If the OnStar system is not damaged and is operating properly**

2. Press the blue OnStar button and ask the advisor to be transferred to the stolen vehicle team to verify the vehicle account has been updated.

3. Verify that OnStar is aware the vehicle has been recovered and that the vehicle account has been updated.

⇒ **If OnStar has not been notified that the vehicle has been recovered**

Contact the customer and advise them that for security purposes, they must contact OnStar and the law enforcement agency to update the vehicle account.

⇓ **If the account has been properly updated**

4. Once the vehicle account has been updated and the start disable request has been removed, DTC B302A will transition to a history DTC. Clear the history DTC.

DTC B3031

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B3031: Security Controller In Learn Mode

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

When learning a coded key, the body control module (BCM) is placed in learn mode. DTC B3031 will set automatically as an indicator that the system is in learn mode and not as a fault indicator. Once the coded key is learned, learn mode will be exited and the DTC cleared. If the BCM does not exit learn mode, DTC B3031 will remain current and indicate a fault. The instrument cluster security indicator will illuminate and the driver information center will display a message.

Conditions for Running the DTC

The immobilizer system is the learn coded keys state.

Conditions for Setting the DTC

The DTC will set any time the BCM enters the learn coded keys state.

Action Taken When the DTC Sets

The security indicator will illuminate. The driver information center will display a message.

Conditions for Clearing the DTC

- A current DTC B3031 will be cleared upon the successful exit of learn mode.
- A history DTC will be cleared after 100 malfunction-free ignition cycles.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify all available keys are correct for the vehicle. This can be accomplished by comparing the part number that is laser etched on the key to the part number listed in the parts catalog.

⇒ **If a key is not correct**

Replace the key

⇓ **If all keys are correct**

2. Perform the Replacing Keys procedure. Refer to *Key with Integrated Transmitter Programming on page 12-28*.
3. Verify the K9 Body Control Module learns the vehicle key and exits the learn coded key state. The scan tool Master Keys Learned parameter should increment to 1.

⇒ **If the K9 Body Control Module does not exit the learn coded key state after the programming attempt**

Replace the K9 Body Control Module

⇓ **If the K9 Body Control Module exits the learn coded key state after the programming attempt**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for body control module replacement, programming, and setup.

DTC B3055

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B3055: No Transponder Modulation or No Transponder

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

When a vehicle key is inserted into the key slot and the vehicle on/off switch is pressed, the transponder embedded in the head of the key is energized by the exciter coils. The energized transponder transmits a signal that contains its unique value, which is received by the body control module (BCM). The BCM then compares this value to a value stored in memory. If the value is not correct, the BCM disables engine start.

Conditions for Running the DTC

Vehicle is ON or in Service Mode.

Conditions for Setting the DTC

The BCM is unable to measure the key transponder value.

Action Taken When the DTC Sets

- Vehicle starting will be disabled.
- The security indicator will illuminate. A service message will be displayed in the driver information center.

Conditions for Clearing the DTC

- A current DTC will be cleared when the BCM detects a valid transponder value from the key.
- A history DTC will be cleared after 100 malfunction-free power mode cycles.

Diagnostic Aids

- Because DTC B3055 may be caused by a malfunctioning vehicle key, it is necessary to have all available keys at the time of diagnosis.
  A possible scenario would be a customer leaving the vehicle with a spare key during the service visit, but the key which they use everyday, not the spare key, is the cause of the DTC. Not having all available keys in this instance would result in the customer concern not being duplicate or a misdiagnosis.
- Ensure that the immobilizer control module is properly installed and fully seated. An audible and/or tactile click will indicate that the immobilizer control module is fully seated. To ensure proper transponder communication, the key must be in a specific location in relation to the immobilizer control module. If the immobilizer control module is not fully seated, transponder communication may not occur and DTC B3055 will set.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC B1370, B1380, or B1441 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

3. Verify all available keys are correct for the vehicle.

⇒ **If a key is not correct**

Replace the key

⇓ **If all keys are correct**

4. Remove the battery from each of the available vehicle keys.

5. Verify that DTC B3055 does not set while attempting to start the vehicle which each available key. To start the vehicle with the key battery removed, the key must be placed in the key slot.

⇒ **If DTC B3055 sets when attempting to start the vehicle with only one of the available keys**

Replace the appropriate key.

⇒ **If DTC B3055 sets when attempting to start the vehicle with all of the available keys**

Replace the K89 Immobilizer Control Module.

⇓ **If DTC B3055 does not set**

6. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for immobilizer control module replacement, programming, and setup

DTC B305C

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B305C: Immobilizer Transponder of Wrong Type Programmed

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

When a vehicle key/keyless entry transmitter is inserted into the key slot/transmitter pocket and the vehicle on/off switch is pressed, the transponder embedded in the key/transmitter is energized by the immobilizer antenna exciter coil. The transponder transmits a signal to the body control module (BCM). The BCM then compares this value to a value stored in memory. If the value is correct, the BCM will send the prerelease password via the serial data circuit to the engine control module (ECM). If the learned key code does not match or a transponder value is not received, the BCM will send the start disable password to the ECM.

Conditions for Running the DTC

- Battery voltage is greater than 9 volts
- Transponder authentication has occurred

Conditions for Setting the DTC

- The programed transponder type does not match the equipped system on the vehicle.
- A transponder used for vehicles without BTM and/or ATH/ATS has been programmed to a vehicle with BTM and/or ATH/ATS.
- A transponder used for vehicles with BTM and/or ATH/ATS has been programmed to a vehicle without BTM and/or ATH/ATS.

Action Taken When the DTC Sets

No action is taken.

Conditions for Clearing the DTC

- A current DTC will be cleared when the BCM detects a programed transponder type that matches the equipped system on the vehicle.
- A history DTC will be cleared after 100 malfunction-free power mode cycles.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Using each vehicle key, attempt to put the vehicle in Service Mode.
2. Verify DTC B305C does not set after each attempt to put the vehicle in Service Mode.

⇒ **If the DTC sets**

Replace the appropriate key or keyless entry transmitter.

⇓ **If the DTC does not set**

3. All OK.

DTC B3060

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B3060: Unprogrammed Transponder Identification Code Received

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

When a vehicle key is inserted into the key slot and the vehicle on/off switch is pressed, the transponder embedded in the head of the key is energized by the exciter coils. The energized transponder transmits a signal that contains its unique value, which is received by the body control module (BCM). The BCM then compares this value to a value stored in memory. If the value is not correct, the BCM disables engine start.

Conditions for Running the DTC

Vehicle is ON or in Service Mode.

Conditions for Setting the DTC

The transponder value measured by the BCM is incorrect or not learned to the vehicle.

Action Taken When the DTC Sets

- Vehicle starting will be disabled.
- The security indicator in the instrument cluster will be illuminated. The driver information center will display a service message.

Conditions for Clearing the DTC

- A current DTC will be cleared when the BCM detects a valid transponder value from the key.
- A history DTC will be cleared after 100 malfunction-free power mode cycles or when a scan tool is used to clear DTCs.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Perform the Vehicle Key Relearn procedure. Refer to *Key with Integrated Transmitter Programming on page 12-28*.
2. Verify the scan tool Key Part Number parameter reads a Key Part Number when turning the vehicle ON with each key.

⇒ **If a Key Part Number is not read**

Replace the appropriate key.

⇓ **If a Key Part Number is read with each key**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Key with Integrated Transmitter Programming on page 12-28

DTC B389A

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B389A: Environment Identification

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

When certain modules are programmed and configured during installation, the module learns a specific environment identifier which is unique to the vehicle. The environment identifier is used to prevent the swapping modules between vehicles. The body control module (BCM) is the keeper of the environment identifier. The Instrument Cluster, Electronic Brake Control Module, HVAC Control Module, Inflatable Restraint Sensing and Diagnostic Module, engine control module (ECM), and Steering Column Lock Module (if equipped) each learn the environment identifier during their configuration process. During vehicle operation, the BCM sends the immobilizer identifier as a challenge and each module responds to the challenge by sending the environment identifier back to the BCM. If the BCM sends an incorrect immobilizer identifier or a specific number of incorrect environment identifiers are received, vehicle starting is disabled.

Conditions for Running the DTC

Ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

An incorrect immobilizer identifier was broadcast by the BCM.

Action Taken When the DTC Sets

- The security indicator in the instrument cluster will illuminate.
- Vehicle starting will be disabled.

Conditions for Clearing the DTC

A current DTC will be cleared when the BCM broadcasts a correct immobilizer identifier.

Diagnostic Aids

If BCM programming is not completed after BCM replacement, the immobilizer identifier will not be learned. If DTC B389A sets immediately after the replacement and programming of a BCM, perform the programming procedure again.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify DTC B389A did not set immediately following the replacement and programming of the K9 Body Control Module.

⇒ **If the DTC set immediately after the replacement and programming of the K9 Body Control Module**

The immobilizer learn procedure was not properly completed. Perform the BCM immobilizer learn using the body control module IMMO Function with Existing Transponder or Remote Key in SPS. Refer to *Immobilizer System Component Programming on page 12-27*.

⇓ **If the DTC did not set immediately after the replacement and programming of the K9 Body Control Module**

2. Verify DTC B3902 is not set in any of the control modules listed below:
   - K20 Engine Control Module
   - K36 Inflatable Restraint Sensing and Diagnostic Module
   - K17 Electronic Brake Control Module
   - K33 HVAC Control Module

- P16 Instrument Cluster
- K60 Steering Column Lock Module (if equipped)

⇒ **If DTC B3902 is set in any of the modules**

Refer to *DTC B3902 on page 12-16*.

⇓ **If DTC B3902 is not set in any of the modules**

3. Perform the K9 Body Control Module immobilizer learn using body control module IMMO Function with Existing Transponder or Remote Key in SPS. Refer to *Immobilizer System Component Programming on page 12-27*.
4. Verify DTC B389A does not set after programming.

⇒ **If the DTC sets after programming**

Replace the K9 Body Control Module.

⇓ **If the DTC does not set after programming**

5. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for body control module replacement, programming, and setup.

DTC B3902

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B3902: Incorrect Immobilizer Identifier Received

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

When certain modules are programmed and configured during installation, the module learns a specific environment identifier which is unique to the vehicle. The environment identifier is used to prevent the swapping modules between vehicles. The body control module (BCM) is the keeper of the environment identifier. The instrument cluster, electronic brake control module, HVAC control module, inflatable restraint sensing and diagnostic module, engine control module (ECM), and steering column lock module (if equipped) each learn the environment identifier during their configuration process. During vehicle operation, the BCM sends the immobilizer identifier as a challenge and each module responds to the challenge by sending the environment identifier back to the BCM. If the BCM sends an incorrect immobilizer identifier or a specific number of incorrect environment identifiers are received, vehicle starting is disabled.

Conditions for Running the DTC

Ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

The control module's environment identifier does not match the environment identifier stored by the BCM.

Action Taken When the DTC Sets

- The security indicator in the instrument cluster will illuminate.
- Vehicle starting will be disabled.

Conditions for Clearing the DTC

A current DTC will be cleared when the module learns a correct environment identifier.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Perform the Programming and Setup procedure for the control module that set DTC B3902.

   Note: When performing the following step, Immobilizer System Component Programming, the module may also need to be reset by using the SPS function Prepare For Removal.

2. Perform the Immobilizer System Component Programming*Immobilizer System Component Programming on page 12-27*.
3. Verify DTC B3902 does not set after programming.

⇒ **If the DTC sets after programming**

Replace the control module that set the DTC.

⇓ **If the DTC does not set after programming**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for instrument cluster, electronic brake control module, HVAC control module, inflatable restraint sensing and diagnostic module, engine control module, or steering column lock module replacement, programming, and setup.

DTC B3935

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B3935: Transponder Authentication

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

When a vehicle key is inserted into the key slot and the vehicle on/off switch is pressed, the transponder embedded in the head of the key is energized by the exciter coils surrounding the key slot. The energized transponder transmits a signal that contains its unique value, which is received by the body control module (BCM). The BCM then compares this value to a value stored in memory. If the value is not correct, the BCM disables engine start.

Conditions for Running the DTC

- Vehicle is ON or in Service Mode.
- A valid transponder value has been read.

Conditions for Setting the DTC

- The transponder value is valid and matches the value stored in the BCM memory.
- The transponder calculation of the challenge from the BCM does not match the BCM calculation.

Action Taken When the DTC Sets

- Vehicle starting will be disabled.
- The security indicator will illuminate. The driver information center will display a service message.

Conditions for Clearing the DTC

- A current DTC will be cleared when a valid transponder value has been read and authenticated.
- A history DTC will be cleared after 100 malfunction-free power mode cycles.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Replace the suspected inoperative or malfunctioning key.
2. Verify DTC B3935 is not set as current.

⇒ **If the DTC is set as current**

Replace the K9 Body Control Module.

⇓ **If the DTC is set as history**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for body control module replacement, programming, and setup

DTC B3976

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B3976: Unconfigured Transponder

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

When a vehicle key is inserted into the key slot and the vehicle on/off switch is pressed, the transponder embedded in the head of the key is energized by the exciter coils surrounding the key slot. The energized transponder transmits a signal that contains its unique value, which is received by the body control module (BCM). The BCM then compares this value to a value stored in memory. If the value is not correct, the BCM disables engine start.

Conditions for Running the DTC

- Vehicle is ON or in Service Mode.
- The BCM is in the learn coded key state.

Conditions for Setting the DTC

The BCM has determined the current key is not configured as a proper vehicle key.

Action Taken When the DTC Sets

- Vehicle starting will be disabled.
- The security indicator in the instrument cluster will be illuminated. A service message will be displayed in the driver information center.

Conditions for Clearing the DTC

- A current DTC will be cleared when the BCM detects a properly configured vehicle key.
- A history DTC will be cleared after 100 malfunction-free power mode cycles or when a scan tool is used to clear DTCs.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify the engine starts with each available key.

⇒ **If the engine does not start with a key**

Replace the key.

⇓ **If the engine starts with all keys**

2. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

DTC B3984

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B3984: Device 1 Environment Identifier Not Programmable

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

When certain modules are programmed and configured during installation, the module learns a specific environment identifier which is unique to the vehicle. The environment identifier is used to prevent the swapping modules between vehicles. The body control module (BCM) is the keeper of the environment identifier. The instrument cluster, electronic brake control module, HVAC control module, inflatable restraint sensing and diagnostic module, engine control module (ECM), and steering column lock module (if equipped) each learn the environment identifier during their configuration process. During vehicle operation, the BCM sends the immobilizer identifier as a challenge and each module responds to the challenge by sending the environment identifier back to the BCM. If the BCM sends an incorrect immobilizer identifier or a specific number of incorrect environment identifiers are received, vehicle starting is disabled.

Conditions for Running the DTC

Ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

An incorrect environment identifier is programmed or no environment identifier is programmed.

Action Taken When the DTC Sets

- The security indicator in the instrument cluster will illuminate.
- Vehicle starting will be disabled.

Conditions for Clearing the DTC

A current DTC will be cleared when the module learns a correct environment identifier.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Perform the Programming and Setup procedure for the control module that set DTC B3984.
2. Verify DTC B3984 does not set after programming.

⇒ **If the DTC sets after programming**

Replace the control module that set the DTC.

⇓ **If the DTC does not set after programming**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for instrument cluster, electronic brake control module, HVAC control module, inflatable restraint sensing and diagnostic module, engine control module, and steering column lock module replacement, programming, and setup.

DTC P0513

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC P0513: Immobilizer Key Incorrect

Circuit/System Description

The body control module (BCM) sends the pre–release information to the hybrid/EV powertrain control module 1 via the serial data circuit. The hybrid/EV powertrain control module 1 then sends a challenge to the BCM. Both the hybrid/EV powertrain control module 1 and BCM perform a calculation on this challenge. The engine control module (ECM) also monitors this challenge and calculates it's own result. If the calculated response from the BCM equals the calculation performed by the hybrid/EV powertrain control module 1 and ECM, the hybrid/EV powertrain control module 1 and ECM will allow vehicle propulsion.

Conditions for Running the DTC

Vehicle is ON or in Service Mode.

Conditions for Setting the DTC

Hybrid/EV Powertrain Control Module 1

The calculated response from the BCM does not equal the calculation performed by the hybrid/EV powertrain control module 1.

Engine Control Module

The calculated response from the BCM does not equal the calculation performed by the ECM.

Action Taken When the DTC Sets

- The security indicator in the instrument cluster will illuminate.
- Vehicle propulsion will be disabled.

Conditions for Clearing the DTC

- A current DTC P0513 will be cleared when a valid calculation is received.
- A history DTC will be cleared after 40 malfunction-free power mode cycles or when a scan tool is used to clear DTCs.

Diagnostic Aids

The key referenced in the DTC descriptor does not refer to the vehicle key. In this case, key is referring to the challenge response.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify there are no immobilizer DTCs set in the K9 Body Control Module.

⇒ **If any immobilizer DTCs are set in the K9 Body Control Module**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If no immobilizer DTCs are set in the K9 Body Control Module**

2. Perform the K9 Body Control Module immobilizer learn using the Body Control Module IMMO Function with Existing Transponder or Remote Key in SPS. Refer to *Immobilizer System Component Programming on page 12-27*.
3. Verify the K9 Body Control Module successfully completes the learn procedure and DTC P0513 is not set.

⇒ **If the K9 Body Control Module does not successfully learn or DTC P0513 is set**

Perform the appropriate immobilizer learn using the IMMO Learn in SPS. Refer to *Immobilizer System Component Programming on page 12-27*.

⇓ **If the K9 Body Control Module successfully completes the learn and DTC P0513 is not set**

4. All OK

DTC P0633

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC P0633: Immobilizer Key Not Programmed

Circuit/System Description

When learning the immobilizer data, as well as the challenge and response sequence, the engine control module (ECM) is placed in learn mode. DTC P0633 will set automatically as an indicator that the system is in learn mode and not as a fault indicator. Once the immobilizer data and challenge/response are learned, learn mode will be exited when the engine is successfully started. If the ECM does not exit learn mode, DTC P0633 will remain current and indicate a fault.

Conditions for Running the DTC

The ECM is in learn mode.

Conditions for Setting the DTC

DTC P0633 will set any time the ECM enters learn mode.

Action Taken When the DTC Sets

The security indicator in the instrument cluster will illuminate.

Conditions for Clearing the DTC

- A current DTC will be cleared upon a successful engine start after exit of learn mode.
- A history DTC will be cleared after 100 malfunction-free ignition cycles.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note: DTC P0633 will clear upon a successful engine start. Any malfunction that will cause a no-start condition will prevent DTC P0633 from clearing. Prior to diagnosing DTC P0633, ensure that all power moding and engine control systems are operating properly and all conditions that may cause a no-start have been corrected. Do not replace the K20 Engine Control Module. Replacing the K20 Engine Control Module will not correct the no-start condition.

1. Verify there are no immobilizer DTCs set in the K9 Body Control Module.

⇒ **If any immobilizer DTCs are set in the K9 Body Control Module**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If no immobilizer DTCs are set in the K9 Body Control Module**

2. Perform the K20 Engine Control Module immobilizer learn using the engine control module IMMO Learn in SPS. Refer to *Immobilizer System Component Programming on page 12-27*.
3. Verify the engine starts after the K20 Engine Control Module completes the learn procedure.

⇒ **If the engine does not start**

An undiagnosed no-start condition exists. Refer to the appropriate subsection and diagnostic to correct the no-start condition.

⇓ **If the engine starts**

4. All OK.

DTC P162B

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC P162B: Remote Vehicle Speed Limiting Signal Message Counter Incorrect

Circuit/System Description

When a remote slow-down request is sent from OnStar, the vehicle communication interface control module sends a serial data message to the engine control module (ECM) indicating that reduced vehicle speed has been requested. Once the request is active, the ECM begins reducing engine torque to match the requested vehicle speed and the REDUCED ENGINE POWER message is displayed.

Conditions for Running the DTC

- The engine run time is greater than 5 s
- A remote slow-down request is sent from OnStar

Conditions for Setting the DTC

- The VIN embedded in the slow-down request does not match the VIN stored in the ECM.
- The rolling code counter embedded in the slow-down request does not increment for ten consecutive messages.

Action Taken When the DTC Sets

- ECM ignores all reduced vehicle speed request messages from the vehicle communication interface module.
- The ECM stores DTC P162B in history.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear after 40 malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

OnStar/Telematics Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Remote Vehicle Speed Limiting Description and Operation on page 12-34

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify the vehicle is equipped with OnStar (RPO UE1) and DTC P162B is set

⇒ **If the vehicle is not equipped with OnStar (RPO UE1) and DTC P162B is set**

Replace the ECM.

⇓ **If the vehicle is equipped with OnStar (RPO UE1) and DTC P162B is set**

2. Perform the Stolen Vehicle Slow-Down Reset procedure with the scan tool.
3. Verify DTC P162B is not set.

⇒ **If DTC P162B is set**

3.1. Reprogram the ECM. Refer to *Control Module References on page 6-3*.

3.2. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.

⇒ If the DTC sets, replace the ECM. If the DTC continues to set after ECM replacement, replace the vehicle communication interface module.

⇓ If the DTC does not set

3.3. All OK.

⇓ **If DTC P162B is not set**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for telematics communication interface control module or engine control module replacement, programming, and setup

DTC P1631

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC P1631: Immobilizer Fuel Enable Signal Not Correct

Circuit/System Description

The body control module (BCM) sends the pre–release information to the hybrid/EV powertrain control module 1 via the serial data circuit. The hybrid/EV powertrain control module 1 then sends a challenge to the BCM. Both the hybrid/EV powertrain control module 1 and BCM perform a calculation on this challenge. The engine control module (ECM) also monitors this challenge and calculates it's own result. If the calculated response from the BCM equals the calculation performed by the hybrid/EV powertrain control module 1 and ECM, the hybrid/EV powertrain control module 1 and ECM will allow vehicle propulsion.

Conditions for Running the DTC

Vehicle is ON or in Service Mode.

Conditions for Setting the DTC

Hybrid/EV Powertrain Control Module 1

The hybrid/EV powertrain control module 1 receives incorrect immobilizer data from the BCM.

Engine Control Module

The ECM receives incorrect immobilizer data from the BCM.

Action Taken When the DTC Sets

- The security indicator in the instrument cluster will illuminate.
- Vehicle starting will be disabled.

Conditions for Clearing the DTC

- A current DTC P1631 will be cleared when correct immobilizer data is received.
- A history DTC will be cleared after 40 malfunction-free power mode cycles or when a scan tool is used to clear DTCs.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify there are no immobilizer DTCs set in the K9 Body Control Module.

⇒ **If any immobilizer DTCs are set in the K9 Body Control Module**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If no immobilizer DTCs are set in the K9 Body Control Module**

2. Perform the K9 Body Control Module immobilizer learn using the Body Control Module IMMO Function with Existing Transponder or Remote Key in SPS. Refer to *Immobilizer System Component Programming on page 12-27*.
3. Verify the K9 Body Control Module successfully completes the learn procedure and DTC P1631 is not set.

⇒ **If the K9 Body Control Module does not successfully learn or DTC P1631 is set**

Perform the appropriate immobilizer learn using the IMMO Learn in SPS. Refer to *Immobilizer System Component Programming on page 12-27*.

⇓ **If the K9 Body Control Module successfully completes the learn and DTC P1631 is not set**

4. All OK

DTC P1649

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC P1649: Immobilizer Security Code Not Programmed

Circuit/System Description

When learning the security code, as well as the challenge and response sequence, the engine control module (ECM) is placed in learn mode. Once the security code and challenge/response are learned, learn mode will be exited when the engine is successfully started.

Conditions for Running the DTC

The ECM is in learn mode.

Conditions for Setting the DTC

The ECM has not learned a security code.

Action Taken When the DTC Sets

The security indicator in the instrument cluster will illuminate.

Conditions for Clearing the DTC

- A current DTC will be cleared upon a successful engine start after exit of learn mode.
- A history DTC will be cleared after 100 malfunction-free ignition cycles.

Reference Information

Schematic Reference

Immobilizer Schematics on page 12-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Immobilizer Description and Operation on page 12-32

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3

Circuit/System Verification

1. Verify there are no immobilizer DTCs set in the K9 Body Control Module.

⇒ **If any immobilizer DTCs are set in the K9 Body Control Module**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If no immobilizer DTCs are set in the K9 Body Control Module**

2. Perform the K20 Engine Control Module immobilizer learn using the engine control module IMMO Learn in SPS. Refer to *Immobilizer System Component Programming on page 12-27*.
3. Verify the engine starts after the K20 Engine Control Module completes the learn procedure.

⇒ **If the engine does not start**

Replace the K20 Engine Control Module.

⇓ **If the engine starts**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for engine control module replacement, programming, and setup.

Symptoms - Immobilizer

Important: The following steps must be completed before using the symptom tables.

1. Perform the *Diagnostic System Check - Vehicle on page 6-91* before using the symptom tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control modules can communicate via the serial data links.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to *Immobilizer Description and Operation on page 12-32*.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the systems. Refer to *Checking Aftermarket Accessories on page 11-871*.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.

Symptom List

Refer to *OnStar Stolen Vehicle Slowdown Active on page 12-25* to diagnose the symptom.

OnStar Stolen Vehicle Slowdown Active

Diagnostic Instructions

Note: This procedure is not used in Brazil.

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Circuit/System Description

When a remote slow-down request is sent from OnStar, the Telematics Communication Interface Control Module sends a serial data message to the engine control module (ECM) indicating that reduced vehicle speed has been requested. Once the request is active, the ECM begins reducing engine torque to match requested vehicle speed and the REDUCED ENGINE POWER message is displayed.

Reference Information

Schematic Reference

OnStar/Telematics Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Remote Vehicle Speed Limiting Description and Operation on page 12-34

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify the vehicle is not in the OnStar initiated Stolen Vehicle Slowdown mode. This can be accomplished by verifying the scan tool Telematics Enhanced Service Immobilization parameter is No.

⇒ **If the scan tool Telematics Enhanced Service Immobilization parameter is Yes**

1.1. Perform the Remote Vehicle Speed Limiting Reset procedure with the scan tool.

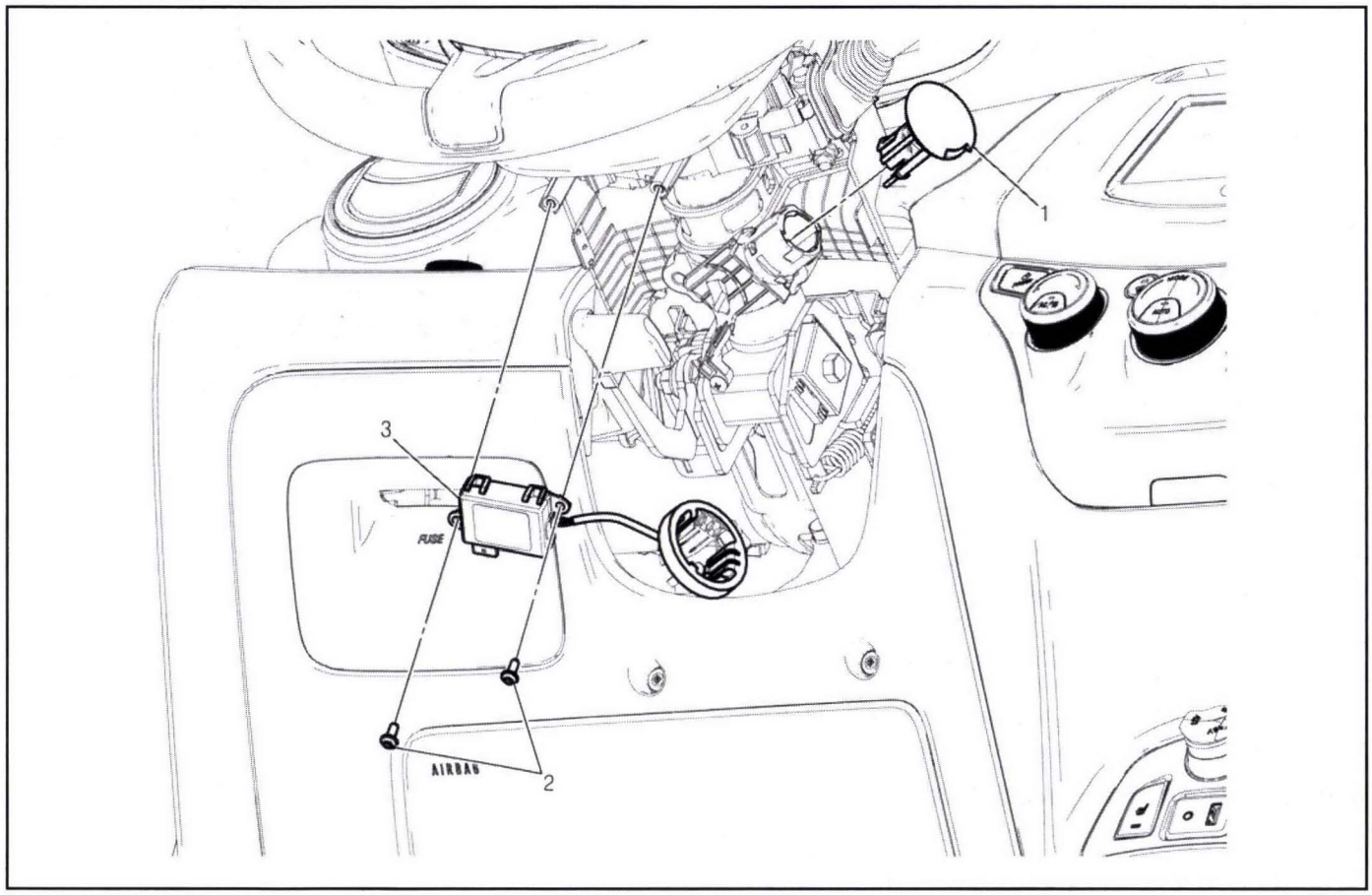
1.2. Press the blue OnStar button and inform the advisor that you need to be transferred to the stolen vehicle team to update the vehicle account.

⇓ **If the scan tool BCM Telematics Enhanced Service Immobilization parameter is No**

2. All OK.

Repair Instructions

Theft Deterrent Module Replacement (With BTM)



3257318

Theft Deterrent Module Replacement (With BTM)

Callout	Component Name
Warning: Refer to Battery Disconnect Warning on page 0-4. **Preliminary Procedure** 1. Remove the steering column lower trim cover. Refer to *Steering Column Lower Trim Cover Replacement on page 14-30*. 2. Disconnect battery negative cable. Refer to *Battery Negative Cable Disconnection and Connection on page 9-20*.	
1	Ignition Key Housing Cover **Procedure** Unclip the cover from ignition key housing.
2	Theft Deterrent Module Screw (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 3 N•m (27 lb in)
3	Theft Deterrent Module **Procedure** 1. Disconnect the electrical connector. 2. Carefully unclip the bracket from ignition key housing.

Immobilizer System Component Programming

This procedure will learn the immobilizer function and require greater than 15 minutes to complete. If the battery voltage is low, charge the battery before proceeding with the learn. If the body control module (BCM) or engine control module (ECM) have been replaced, they must be programmed before performing this learn procedure.

Depending on the immobilizer function being learned or the component replaced, different learn functions are required to be performed. These learn functions are as follows:

Immobilizer System Component Programming

Function name on SPS tool:	Function description:	When the function should be used:	Notes:
Body Control Module IMMO Function with Existing Transponder or Remote Key	The BCM will relearn the immobilizer passwords and data while reusing the existing vehicle keys	The BCM has been replaced and the existing vehicle keys are being reused or a diagnostic has instructed to perform the learn	—
Body Control Module IMMO Function with New Transponder or Remote Key	The BCM will relearn the immobilizer passwords and data while using new vehicle keys	The BCM has been replaced and new vehicle keys are being reused	—
Engine Control Module IMMO Learn	The ECM will relearn the immobilizer passwords and data	The ECM has been replaced or a diagnostic has instructed to perform the learn	—
Engine Control Module and Body Control Module IMMO Learn	The ECM and BCM will learn new immobilizer passwords and data	Both the ECM and BCM have been replaced (this selection will REQUIRE new vehicle keys be used)	Because both the ECM and BCM have been replaced and are learning new immobilizer passwords and data, all vehicle keys must also be replaced
Program Transponder or Remote Key (Add)	A new vehicle key will learn the immobilizer passwords and data	A new vehicle key is being added (does not affect other vehicle keys)	This function may not be available in all sales regions
Program Transponder or Remote Key (Delete)	All existing vehicle keys will be invalidated and any desired keys are relearned	All vehicle keys are desired to be invalidated and certain keys relearned or a diagnostic has instructed to perform the learn	This procedure may be used if a customer has had their keys lost or stolen and wishes to invalidate the keys, making them unable to start the vehicle

1. Connect a scan tool to the vehicle and access SPS.
2. Vehicle in Service Mode, engine OFF.
3. Ensure that all power consuming devices are turned OFF on the vehicle.
4. Select SPS application and follow the on-screen instructions.
5. Select Reprogram ECU.
6. Select IMMO Immobilizer Learn – Setup.
7. Select the appropriate programming function based on the component that was replaced or is being programmed. Refer to the table at the top of this document for assistance in choosing the correct programming function.

Note:

- At multiple times during the learn procedure, SPS will instruct you to turn the vehicle to Service Mode. Make sure the vehicle is actually in the Service Mode before continuing on the SPS terminal. If the vehicle is not in the Service Mode, the learn procedure will fail.
- The key slot is located behind the round rubber cap on the steering column. The round rubber cap needs to be removed to access the slot.

8. Follow the on-screen instructions.

   Note: If the programming does not complete or hangs during the programming operation, refer to Unable to Complete Programming below.

9. After programming all keys "Programming Complete" is displayed.

10. Press and hold the vehicle ON/OFF switch for 15 seconds.
11. Press the lock and unlock button on each transmitter that was programmed. This will awaken each transmitter and allow passive and active keyless entry functions to be established.
12. With a scan tool, clear any DTCs.
13. Verify each key is operating properly. Operate each of the keyless entry functions using the buttons on the transmitter and then start the vehicle. When verifying operation, make sure that no other keys are near the vehicle.

Unable to Complete Programming

When attempting to program immobilizer components, various conditions may prevent the programming operation from completing. These conditions may be caused by normal system operation, a system malfunction, or an external influence. Common symptoms of a incomplete programming is receiving an error message during the attempt or having the SPS application become unresponsive.

- DTCs are set in the body control module (BCM)

  The immobilizer system is a function of the BCM software. If immobilizer DTCs are set in the BCM, such as DTC B2955, a fault has been identified in the immobilizer system. If this is not corrected before attempting to program components, the programming may not complete. Correct all immobilizer DTCs before attempting to program any immobilizer components.
- The key has been programmed to another vehicle or is not the correct type for the vehicle

  A key can only be programmed to a single vehicle. Once a key is programming to a vehicle, it is paired for the life of the key. The key can be learned to the same vehicle again and again, but it is not able to be programmed to a different vehicle.

  Many vehicle are available with both a base keyless entry system and an optional passive entry system. These keys typically look identical but cannot be substituted for one another. To verify the key is correct, compare the part number that is etched on the key to the part number identified in the parts catalog. The key should be correct for the system installed in the vehicle.
- The theft deterrent module is not properly secured or the key is not properly positioned in the pocket/slot.

  A theft deterrent module that is not fully seated or is otherwise not properly secured may prevent a coupling between the transponder located in the key and the theft deterrent module. Being out of place by as little as 1 mm may prevent programming from completing. Make sure the theft deterrent module is properly installed and fully seated in it's clip.

  The key shank must be fully extended so that the entire key shank fits into the programming slot.

  To determine if the theft deterrent module is properly secured, remove the battery from the key and place the key into the pocket/slot. Attempt to change the vehicle mode by pressing the vehicle ON/OFF switch. The vehicle should change modes. If the NO REMOTE DETECTED message is displayed on the DIC, the theft deterrent module may not be properly secured.
- External interference is interrupting the programming operation

  External RF interference and EMI may interrupt the low frequency coupling between the key and theft deterrent module. This interference may come from many different locations. Devices plugged into the vehicle power outlets such as cell phone chargers, laptop computers, GPS devices, etc. may cause interference. Vehicle location may also cause interference. Locations near airports and military installations may causer interference. Remove all customer installed devices and, if necessary, move the vehicle if interference is suspected.

Key with Integrated Transmitter Programming

Keys can be programmed in various ways using the procedures outlined below. Using the Replacing Keys procedures will first erase all the known keys from the vehicle. Any existing keys and any new keys will then be programmed. This procedure should be used any time a key is required to be unlearned or erased from a vehicle. If a new key is being learned to a vehicle to replace a damaged, inoperative, or stolen key, the Replacing Keys procedure must be used. This ensures that the old key cannot be used to access or start the vehicle after programming.

The Adding Keys procedure does not erase any keys prior to programming. The procedure will simply program the key into the next available slot. The Adding Keys procedure should only be used when adding an additional key to the vehicle. The Adding Keys procedure should never be used to program a key to a vehicle that is having a key replaced, regardless of the cause for the replacement.

Replacing Keys (Without SPS)

Note:

- This procedure will unlearn all previously learned keys. All keys that are to be programmed must be with the vehicle.
- This procedure will take approximately 30 minutes to complete.
- A total of eight keys maybe be learned to a single vehicle.
- This procedure will only learn the vehicle key information. This procedure will not learn any immobilizer information between the body control module (BCM) and engine control module (ECM).
- This procedure may be used with or without existing learned keys being present. If existing keys are present, keep the keys away from the vicinity of the vehicle. Failure to keep learned keys away from the vehicle will result in the learn changing to the Adding Keys procedure.
- The keys to be learned must duplicate the mechanical cut of the current key.

1. Insert the mechanical key of the new key into the key lock cylinder located on the outside of the driver door and turn the key to the unlock position five times within ten seconds. The Driver Information Center (DIC) will display Remote Learn Pending, Please Wait.
2. After ten minutes, the DIC will display Press Engine Start Button To Learn. Press the vehicle ON/OFF switch. The DIC will again display Remote Learn Pending, Please Wait.
3. Repeat Step 2 two additional times, for a total of thirty minutes. All previously known keys have now been unlearned. Remaining keys can be relearned during the next steps. The DIC display will now display Ready For Remote # 1.

   Note: The key slot is located behind the round rubber cap on the steering column. The round rubber cap needs to be removed to access the slot.
4. Remove the round rubber cap on the steering column. Extend the key blade on the new key and insert the key into the key slot.

   Note: If the programming does not complete or hangs during the programming operation, refer to Unable to Complete Programming below.
5. Press the vehicle ON/OFF switch. When the key is learned the DIC will indicate that it is ready to program the next key.
6. Remove the key from the key slot and press the unlock button. To program additional keys, repeat Steps 4 through 6.
7. When all additional keys are programmed, press and hold the vehicle ON/OFF switch for 5 seconds to exit programming mode.

Replacing Keys (With SPS)

Note:

- This procedure will unlearn all previously learned keys. All keys that are to be programmed must be with the vehicle.
- This procedure may be used with or without existing learned keys being present.
- This procedure will take more than 15 minutes to complete.
- A total of eight keys maybe be learned to a single vehicle.
- This procedure will only learn the vehicle key information. This procedure will not learn any immobilizer information between the body control module (BCM) and engine control module (ECM).
- If the battery voltage is low, charge the battery before continuing with the procedure.

1. Connect a scan tool to the vehicle and access SPS.
2. Ensure that all power consuming devices are turned OFF on the vehicle.
3. Select the SPS application and follow the on-screen instructions.
4. Select Reprogram ECU.
5. Select IMMO Immobilizer Learn - Setup.
6. Select the Program Transponder or Remote Key (Delete) function.

   Note:

   - At multiple times during the learn procedure, SPS will instruct you to turn the vehicle to Service Mode. Make sure the vehicle is actually in the Service Mode before continuing on the SPS terminal. If the vehcile is not in the Service Mode, the learn procedure will fail.
   - The key slot is located behind the round rubber cap on the steering column. The round rubber cap needs to be removed to access the slot.
7. Follow the on-screen instructions.

   Note: If the programming does not complete or hangs during the programming operation, refer to Unable to Complete Programming below.
8. After programming all keys, Programming Complete, is displayed.
9. Press and hold the vehicle ON/OFF switch for 15 seconds.
10. Press the lock and unlock button on each key that was programmed. This will awaken each key and allow passive and active keyless entry functions to be established.
11. With a scan tool, clear any DTCs.
12. Verify each key is operating properly. Operate each of the keyless entry functions using the buttons on the key and then start the vehicle. When verifying operation, make sure that no other keys are near the vehicle.

Adding Keys (Without SPS)

Note:

- To initiate, this procedure requires that 1 learned key be available.
- A total of eight keys maybe be learned to a single vehicle.
- This procedure adds keys only. The procedure does not erase previously learned keys.
- The keys to be learned must duplicate the mechanical cut of the current key.

1. Place the recognized key(s) in the vehicle cupholder.
2. Insert the mechanical key of the new key into the key lock cylinder located on the outside of the driver door and turn the key to the unlock position five times within ten seconds. The Driver Information Center (DIC) will display Ready For Remote #2, 3, 4 or 5.

   Note: The key slot is located behind the round rubber cap on the steering column. The round rubber cap needs to be removed to access the slot.
3. Remove the round rubber cap on the steering column. Extend the key blade on the new key and insert the key into the key slot.

   Note: If the programming does not complete or hangs during the programming operation, refer to Unable to Complete Programming below.
4. Press and hold the vehicle ON/OFF switch for two seconds. When the key is programmed, the DIC will show that it is ready to program the next key.

5. Remove the key from the key slot and press the unlock button. To program additional keys, repeat Steps 3 through 5.
6. When all additional keys are programmed, press and hold the vehicle ON/OFF switch for 10 seconds to exit programming mode.

Adding Keys (With SPS)

Note:

- This procedure may be used with or without existing learned keys being present.
- This procedure will take more than 15 minutes to complete.
- A total of eight keys maybe be learned to a single vehicle.
- This procedure will only learn the vehicle key information. This procedure will not learn any immobilizer information between the body control module (BCM) and engine control module (ECM).
- If the battery voltage is low, charge the battery before continuing with the procedure.

1. Connect a scan tool to the vehicle and access SPS.
2. Ensure that all power consuming devices are turned OFF on the vehicle.
3. Select the SPS application and follow the on-screen instructions.
4. Select Reprogram ECU.
5. Select IMMO Immobilizer Learn - Setup.
6. Select the Program Transponder or Remote Key (Add) function.

   Note:

   - At multiple times during the learn procedure, SPS will instruct you to turn the vehicle to Service Mode. Make sure the vehicle is actually in the Service Mode before continuing on the SPS terminal. If the vehcile is not in the Service Mode, the learn procedure will fail.
   - The key slot is located behind the round rubber cap on the steering column. The round rubber cap needs to be removed to access the slot.
7. Follow the on-screen instructions.

   Note: If the programming does not complete or hangs during the programming operation, refer to Unable to Complete Programming below.
8. After programming all keys, Programming Complete, is displayed.
9. Press and hold the vehicle ON/OFF switch for 15 seconds.
10. Press the lock and unlock button on each key that was programmed. This will awaken each key and allow passive and active keyless entry functions to be established.
11. With a scan tool, clear any DTCs.
12. Verify each key is operating properly. Operate each of the keyless entry functions using the buttons on the key and then start the vehicle. When verifying operation, make sure that no other keys are near the vehicle.

Unable to Complete Programming

When attempting to program immobilizer components, various conditions may prevent the programming operation from completing. These conditions may be caused by normal system operation, a system malfunction, or an external influence. Common symptoms of a incomplete programming is receiving an error message during the attempt or having the SPS application become unresponsive.

- DTCs are set in the body control module (BCM)

  The immobilizer system is a function of the BCM software. If immobilizer DTCs are set in the BCM, such as DTC B2955, a fault has been identified in the immobilizer system. If this is not corrected before attempting to program components, the programming may not complete. Correct all immobilizer DTCs before attempting to program any immobilizer components.
- The key has been programmed to another vehicle or is not the correct type for the vehicle

  A key can only be programmed to a single vehicle. Once a key is programming to a vehicle, it is paired for the life of the key. The key can be learned to the same vehicle again and again, but it is not able to be programmed to a different vehicle.

  Many vehicle are available with both a base keyless entry system and an optional passive entry system. These keys typically look identical but cannot be substituted for one another. To verify the key is correct, compare the part number that is etched on the key to the part number identified in the parts catalog. The key should be correct for the system installed in the vehicle.
- The theft deterrent module is not properly secured or the key is not properly positioned in the pocket/slot.

  A theft deterrent module that is not fully seated or is otherwise not properly secured may prevent a coupling between the transponder located in the key and the theft deterrent module. Being out of place by as little as 1 mm may prevent programming from completing. Make sure the theft deterrent module is properly installed and fully seated in it's clip.

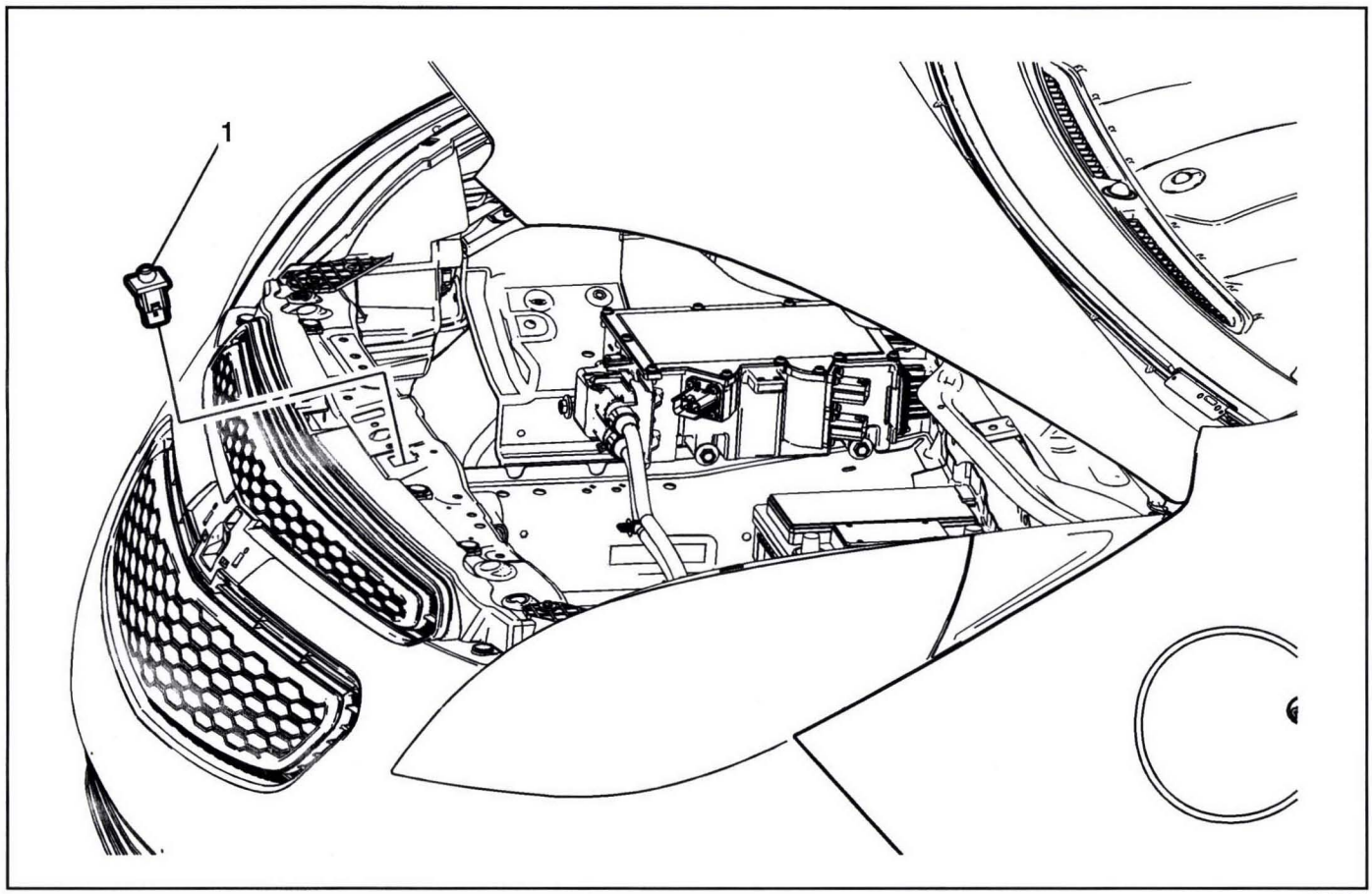
  The key shank must be fully extended so that the entire key shank fits into the programming slot.

  To determine if the theft deterrent module is properly secured, remove the battery from the key and place the key into the pocket/slot. Attempt to change the vehicle mode by pressing the vehicle ON/OFF switch. The vehicle should change modes. If the NO REMOTE DETECTED message is displayed on the DIC, the theft deterrent module may not be properly secured.
- External interference is interrupting the programming operation

  External RF interference and EMI may interrupt the low frequency coupling between the key and theft deterrent module. This interference may come from many different locations. Devices plugged into the vehicle power outlets such as cell phone chargers, laptop computers, GPS devices,

etc. may cause interference. Vehicle location may also cause interference. Locations near airports and military installations may causer interference. Remove all customer installed devices and, if necessary, move the vehicle if interference is suspected.

Hood Ajar Indicator Switch Replacement



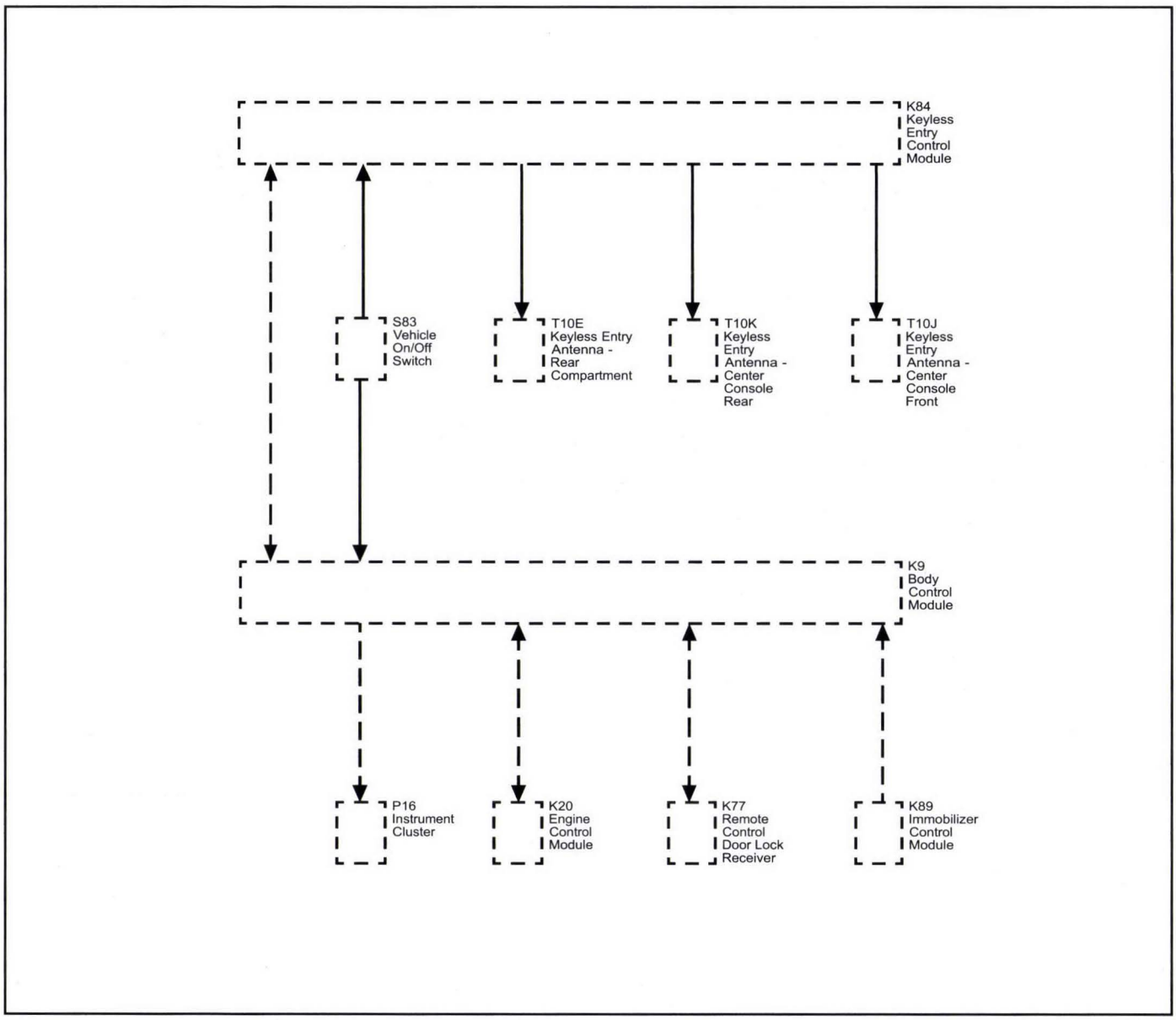
3212645

Hood Ajar Indicator Switch Replacement

Callout	Component Name
1	Hood Ajar Indicator Switch **Procedure** 1. Using the appropriate tool, gently depress tabs to remove. 2. Disconnect the electrical connector.

Description and Operation

Immobilizer Description and Operation



3535456

The immobilizer system functions are provided by the keyless entry control module, remote control door lock receiver, body control module (BCM), hybrid/EV powertrain control module 1, and engine control module (ECM), as well as any modules which store and report the environment identifier. The keyless start system use low frequency antennas in three different locations on the vehicle to determine the location of the transmitter. Multiple antenna are used to ensure complete coverage of the vehicle interior and rear compartment.

When the vehicle ON/OFF switch is pressed, the low frequency antennas emit a challenge to the keyless entry transmitter. The transmitter receives this challenge and emits it's response as an RF message. The transmitter transmits a signal that contains its unique value, which is received by the BCM through the remote control door lock receiver. The BCM then compares this value to a value stored in memory. The BCM also monitors various modules to determine if the stored environment identifiers match.

If both the environment identifier and the value received from the transponder match, the BCM will send the prerelease password via serial data to the hybrid/EV powertrain control module 1. If the encrypted code's unique value is incorrect or the environment identifier does not match, the BCM will send the fuel disable message to the hybrid/EV powertrain control module 1.

When the hybrid/EV powertrain control module 1 receives the BCM prerelease password, the hybrid/EV powertrain control module 1 will challenge the password. The hybrid/EV powertrain control module 1 sends this challenge to the BCM via serial data. Both the hybrid/EV powertrain control module 1 and BCM perform a calculation on this challenge. Additionally, the ECM will also monitor this challenge and calculate it's

own response. If the BCM calculated response to the challenge equals the calculation performed by the hybrid/EV powertrain control module 1 and ECM, the hybrid/EV powertrain control module 1 and ECM will allow vehicle propulsion.

If RF communication is interrupted, a "No Remote Detected" message will be displayed on the DIC. In these cases, the extended transmitter key blade can be placed in the transmitter slot located in the upper instrument panel storage compartment, under the rubber mat. The immobilizer antenna coil is located directly beneath the transmitter slot. Placing the transmitter in the pocket will create a low powered coupling between the transmitter and immobilizer antenna, allowing communications to occur and enabling vehicle starting.

The components of the theft system are as follows:

- BCM
- Hybrid/EV powertrain control module 1
- ECM
- Immobilizer antenna
- Ignition key or keyless entry transmitter
- Security indicator
- Various modules which store and report the environment identifier

Body Control Module (BCM)

The immobilizer system is an integral part of the BCM and is controlled internally within the BCM. The BCM can learn up to 8 keys (transponder values).

The BCM uses the following inputs:

- Environment identifier exchange with various modules
- Encrypted code from the vehicle key, received by the immobilizer antenna

The BCM uses the following outputs:

- Prerelease password communication with ECM
- Challenge/response with ECM

When the vehicle ON/OFF switch is pressed, the low frequency antennas emit a challenge to the keyless entry transmitter. The transmitter receives this challenge and emits it's response as an RF message. The transmitter transmits a signal that contains its unique value, which is received by the BCM through the remote control door lock receiver. The BCM then compares this value to a value stored in memory. The BCM then performs one of the following functions:

- If the encrypted code value matches the values stored in the BCM memory, the BCM will send the prerelease password to the ECM via serial data.
- If the encrypted code unique value does not match the value stored in the BCM, the BCM will send the start disable message to the ECM via serial data.
- If the BCM is unable to measure the ignition key encrypted code value, the BCM will not send any messages to the ECM.

Hybrid/EV Powertrain Control Module 1

When the hybrid/EV powertrain control module 1 receives the BCM prerelease password, the hybrid/EV powertrain control module 1 will challenge the password. The hybrid/EV powertrain control module 1 sends this challenge to the BCM via the serial data circuit. Both the hybrid/EV powertrain control module 1 and BCM perform a calculation on this challenge. If the calculated response from the BCM equals the calculation performed by the hybrid/EV powertrain control module 1, the hybrid/EV powertrain control module 1 will allow vehicle propulsion.

The hybrid/EV powertrain control module 1 will disable vehicle propulsion if any of the following immobilization conditions occur:

- The prerelease password is invalid.
- The start disable password is sent by the BCM.
- No passwords are received. There is no communication with the BCM.
- The BCM calculated response to the challenge does not equal the calculation performed by the hybrid/EV powertrain control module 1.

Engine Control Module (ECM)

The ECM functions in the immobilizer system as a type of slave device. It does not general the password challenge, but it does monitor the challenge and response messages between the BCM and hybrid/EV powertrain control module 1. The ECM will calculate it's own result to the challenge. If the ECM response does not equal the BCM response, the ECM may also disable vehicle propulsion. To allow vehicle propulsion, the response from the BCM, ECM, and hybrid/EV powertrain control module 1 must all match.

The ECM will disable vehicle propulsion if any of the following immobilization conditions occur:

- The start disable password is sent by the BCM.
- No passwords are received. There is no communication with the BCM or hybrid/EV powertrain control module 1.
- The BCM calculated response to the challenge does not equal the calculation performed by the ECM.

Immobilizer Antenna

The immobilizer antenna contains an immobilizer coil. The coil passively powers the transponder located in the ignition key when the key is in the transmitter slot. When powered, the key transmits its unique value to the immobilizer antenna, which is then relayed to the BCM via a LIN serial data circuit. The immobilizer antenna also receives B+ and ground from the BCM.

The immobilizer antenna is used to:

1. Learn keys
2. To start vehicle with or without RF interference
3. To start vehicle when key battery is dead

Keyless Entry Transmitter

Each keyless entry transmitter contains a transponder with a unique encrypted value. The transponder's encrypted value is fixed and unable to be changed. The

immobilizer system uses the transponder value to determine if a valid transmitter is being used to start the vehicle.

Environment Identifier

Various modules throughout the vehicle learn a specific environment identifier during the module programming process. The environment identifier is learned by each individual module and matches the environment identifier stored in the BCM. Prior to starting after a battery disconnect, each of the modules which store a environment identifier will compare their identifier to that of the identifier stored in the BCM. If all the identifiers match, the engine starting process will continue. If the environment identifiers do not match, engine starting will be disabled.

Security Indicator

The BCM will command the instrument panel cluster to illuminate the security indicator when the vehicle is in Service Mode to indicate a fault has occurred within the immobilizer system and when the engine starting is disabled.

Remote Vehicle Speed Limiting Description and Operation

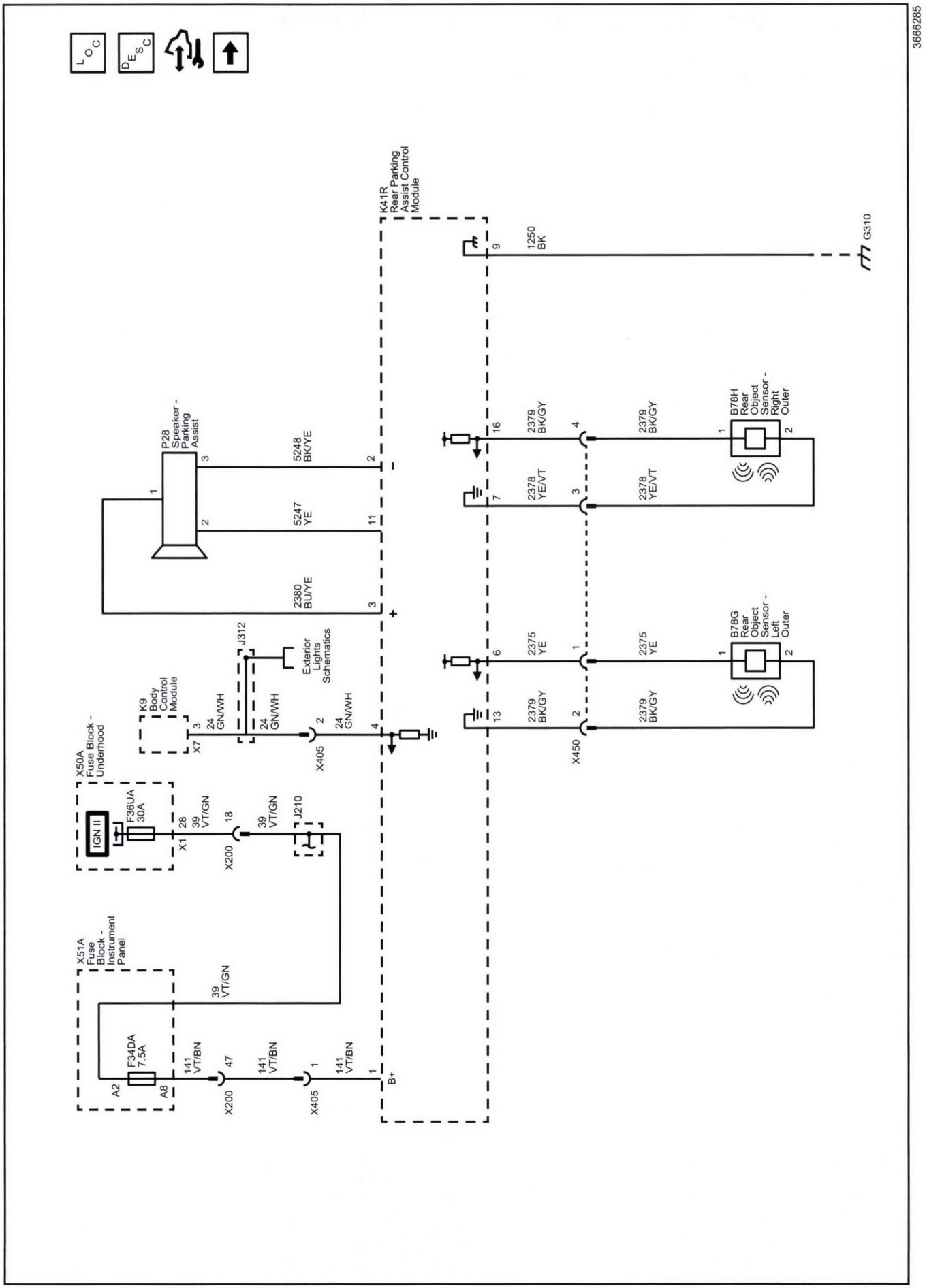
Certain vehicles equipped with OnStar® now have an additional feature that allows for remote limiting of the vehicle's speed. This OnStar® feature is called Stolen Vehicle Slow-Down and is now part of the OnStar® Stolen Vehicle Assistance service. This feature, when used in conjunction with local law enforcement and strict guidelines at the OnStar® Call Center, will slow the vehicle by interacting with the engine control system.

When the engine control system receives a valid request from the OnStar® telematics communications interface module, it will enter into a reduced engine power/vehicle speed limiting mode, which will decelerate the vehicle. Once the request is active the engine control module begins reducing engine torque to match requested vehicle speed and a REDUCED ENGINE POWER indication is displayed. No DTCs will be set during this process.

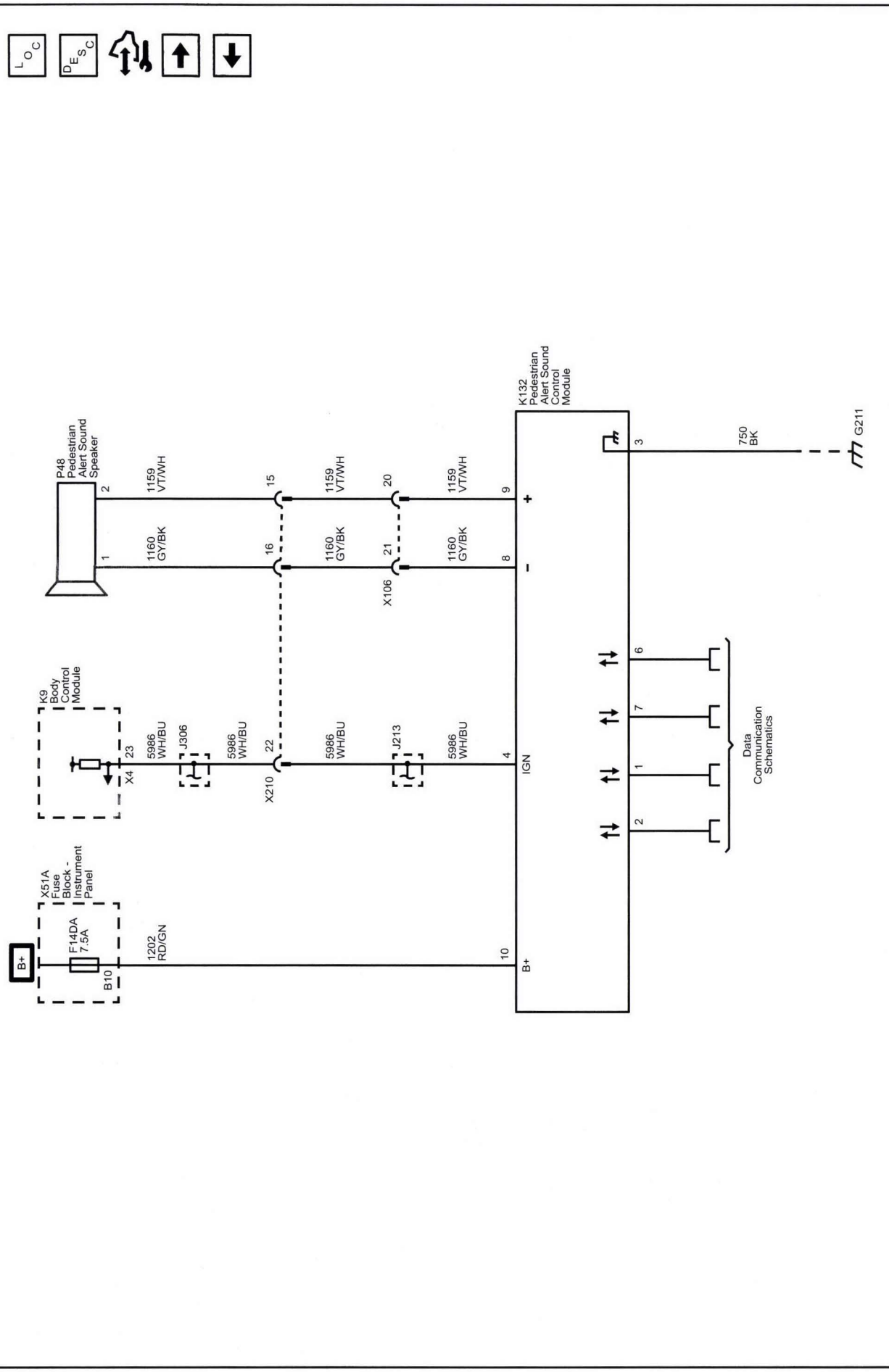
Object Detection and Pedestrian Protection

Schematic and Routing Diagrams

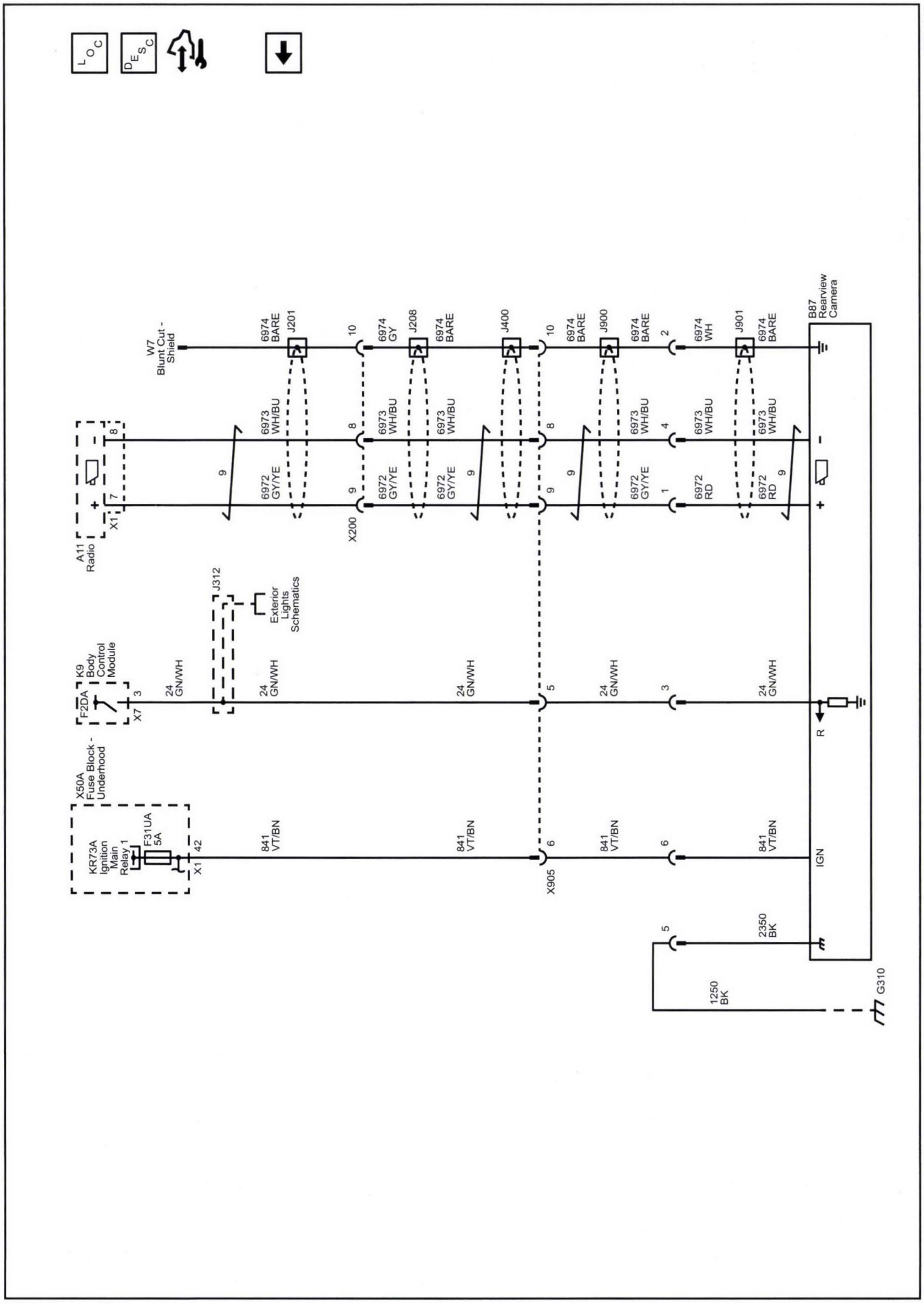
Object Detection Schematics (Object Detection)



Object Detection Schematics (Pedestrian Alert)



Object Detection Schematics (Rearview Camera (UVC))



Diagnostic Information and Procedures

DTC B010E

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B010E 04: Pedestrian Friendly Alert Audio Output Circuit Open

DTC B010E 1B: Pedestrian Friendly Alert Audio Output Circuit Signal Cross Coupled

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	1	1	-	-
Signal +	B010E 1B	B010E 04	1	-
Signal –	B010E 1B	B010E 04	1	-
Ground	-	1	-	-
1. Pedestrian Alert System Inoperative				

Circuit/System Description

Due to the lack of audible engine noise, hybrid and electric vehicles are very quiet at low speeds. The pedestrian alert system emits an audible sound at speeds less than 34 km/h to alert pedestrians that the vehicle is approaching. The sound will fade in and out and vary in pitch depending on vehicle speed. The K132 Pedestrian Alert Sound Control Module is supplied with B+ and ground. It communicates using serial data. The module outputs a signal to the P48 Pedestraian Alert Sound Speaker.

Conditions for Running the DTC

- Vehicle Power Mode: RUN
- Battery voltage between 9–16V
- Pedestrian alert system generating sound.

Conditions for Setting the DTC

B010E 04

The Pedestrian Alert Sound Control Module has detected an open in the Pedestrian Alert Sound Speaker circuit.

B010E 1B

The Pedestrian Alert Sound Control Module has detected a short in the Pedestrian Alert Sound Speaker circuit.

Action Taken When the DTC Sets

- The Pedestrian Alert System is disabled.
- Service Pedestrian Friendly Alert indicator is ON.

Conditions for Clearing the DTC

- Fault not present.
- DTC will clear after 100 fault-free ignition cycles.

Reference Information

Schematic Reference

Object Detection Schematics on page 12-36

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Object Detection Description and Operation (with park assist, UD7) on page 12-52 or *Object Detection Description and Operation (with rearview camera, UVC) on page 12-53*

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the P48 Pedestrian Alert Sound Speaker. Ignition ON,
2. Test for less than 10 Ω between the low reference circuit terminal 2 and ground.

⇒ **If 10 Ω or greater**

2.1. Ignition OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the ground circuit.

⇒ If less than 2 Ω, replace the K132 Pedestrian Alert Sound Control Module.

⇓ **If less than 10 Ω**

3. Test for 3.5–5.5 V between signal circuit terminal 1 and terminal 2 and low reference.

⇒ **If less than 3.5 V**

3.1. Ignition OFF, disconnect the harness connector at the K132 Pedestrian Alert Sound Control Module.

3.2. Test for infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

3.3. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K132 Pedestrian Alert Sound Control Module.

⇒ **If greater than 5.5 V**

3.1. Ignition OFF, disconnect the harness connector at the K132 Pedestrian Alert Sound Control Module. Ignition ON.

3.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K132 Pedestrian Alert Sound Control Module.

⇓ **If between 3.5–5.5 V**

4. Test or replace the P48 Pedestrian Alert Sound Speaker.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Pedestrian Sound Alert Speaker Replacement on page 12-49*
- *Control Module References on page 6-3* for pedestrian alert sound control module replacement, programming and setup.

DTC B1015

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B1015: Vehicle Identification Number Information

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

When the ignition is turned ON, the advanced parking assist control module and the frontview camera module receive the vehicle identification number (VIN) from the body control module (BCM). The modules will compare the VIN received to the VIN stored in memory.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

The stored VIN does not match the received VIN.

Action Taken When the DTC Sets

- The parking assist system or the lane departure warning system is disabled.
- The driver information center may display a system service message.

Conditions for Clearing the DTC

The stored VIN matches the VIN stored in the body control module.

Reference Information

Schematic Reference

Object Detection Schematics on page 12-36

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Object Detection Description and Operation (with park assist, UD7) on page 12-52 or *Object Detection Description and Operation (with rearview camera, UVC) on page 12-53*

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC B1015 is not set.

⇒ **If the DTC is set**

2.1. Program the control module that set the DTC.

2.2. Verify that DTC B1015 is not set.

⇒ If the DTC is set, replace the control module that set the DTC.

⇓ If the DTC is not set

2.3. All OK

⇓ **If the DTC is not set**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair

Control Module References on page 6-3 for control module replacement, programming, and setup.

Symptoms - Object Detection

Note: The following steps must be completed before using the symptom tables:

1. Perform the *Diagnostic System Check - Vehicle on page 6-91* before using the Symptom Tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control module can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to *Object Detection Description and Operation (with park assist, UD7) on page 12-52* or *Object Detection Description and Operation (with rearview camera, UVC) on page 12-53*.

Visual/Physical Inspection

- Inspect for aftermarket devices which may affect the operation of the system. Refer to *Checking Aftermarket Accessories on page 11-871*.
- Inspect the easily accessible or visible system components for obvious damage or conditions which may cause the symptom.
- This system can use various sensors that need to be clean in order to function properly. Make sure to check the following sensors for obstructions:
  - Parking assist sensors located in the rear bumper cover

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.

Symptom List

- *Parking Assist System Malfunction on page 12-42*

Parking Assist System Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Circuit/System Description

The Rear Parking Assist Control Module is supplied ignition voltage from the I/P fuse block. When the transmission is in reverse, the system is turned ON, ignition voltage is supplied from the BCM. The Rear Object Sensors are supplied with signal circuits referenced from 8 volts and low reference by the Rear Parking Assist Control Module. The Speaker – Parking Assist is provided with B+ from the Rear Parking Assist Control Module provides a PWM low signal to the speaker to provide an audible alert.

Diagnostic Aids

The park assist system is capable of performing an object detection sensor self test. When the vehicle is shifted into reverse, the system will enter the sensor self test mode and the park assist module will verify inputs from the object detection sensors. The park assist module indicates sensor status using the system alarm. If both sensor signals are being received by the rear park assist, module 1 single short tone will be activated. When one or both sensor signals are not received, the module will respond by activating the alarm with 6 tones in a 1 s period followed by an error tone. This error tone can be 1 tone repeated for a left sensor fault, and 2 tones repeated for a right sensor fault. These will be repeated every 1 s. If both sensors are faulted, the module will respond by activating the alarm with 3 tones repeated every 1.5 s.

Circuit/System Verification

1. Vehicle ON.
2. Verify the object alarm sounds 1 short tone when shifting the transmission into reverse.

⇒ **If the object alarm sounds 1 or 2 tones repeated**

Refer to Circuit/System Testing – Rear Object Sensor Malfunction.

⇒ **If the object alarm sounds 3 tones repeated or no tones**

Refer to Circuit/System Testing – Rear Parking Assist Control Module/Speaker Malfunction

⇓ **If the object alarm sounds 1 short tone**

3. All OK.

Circuit/System Testing

Rear Object Sensor Malfunction

1. Vehicle OFF and all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down. Disconnect the harness connector at the appropriate B78 Rear Object Sensor.
2. Test for less than 10 Ω between the low reference circuit terminal 2 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF, disconnect the harness connector at the K41R Rear Parking Assist Control Module.

2.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K41R Rear Parking Assist Control Module.

⇓ **If less than 10 Ω**

3. Vehicle ON.
4. Test for 7.5–9.5 V between the 8 V reference circuit terminal 1 and ground.

⇒ **If less than 7.5 V**

4.1. Vehicle OFF, disconnect the harness connector at the K41R Rear Parking Assist Control Module.

4.2. Test for infinite resistance between the 8 V reference circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

4.3. Test for less than 2 Ω in the 8 V reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K41R Rear Parking Assist Control Module.

⇒ **If greater than 9.5 V**

4.1. Vehicle OFF, disconnect the harness connector at the K41R Rear Parking Assist Control Module, vehicle ON.

4.2. Test for less than 1 V between the 8 V reference circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K41R Rear Parking Assist Control Module.

⇓ **If between 7.5–9.5 V**

5. Replace the appropriate B78 Rear Object Sensor.

Rear Parking Assist Control Module/Speaker Malfunction

1. Vehicle OFF and all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down. Disconnect the harness connector at the K41R Rear Parking Assist Control Module.
2. Test for less than 10 Ω between the ground circuit terminal 9 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF, disconnect the harness connector at the K41R Rear Parking Assist Control Module.

2.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K41R Rear Parking Assist Control Module.

⇓ **If less than 10 Ω**

3. Vehicle ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 1 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Vehicle OFF.

4.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K41R Rear Parking Assist Control Module.

⇓ **If the test lamp illuminates**

5. Vehicle ON, park brake applied, transmission in REVERSE.
6. Verify a test lamp illuminates between the control circuit terminal 4 and ground.

⇒ **If the test lamp does not illuminate**

6.1. Vehicle OFF, disconnect the X7 harness connector at the K9 Body Control Module.

6.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

7. Vehicle OFF, disconnect the harness connector at the P28 Speaker – Parking Assist.
8. Test for less than 10 Ω between the low reference circuit terminal 1 and ground.

⇒ **If 10 Ω or greater**

8.1. Vehicle OFF, disconnect the harness connector at the K41R Rear Parking Assist Control Module.

8.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K41R Rear Parking Assist Control Module.

⇓ **If less than 10 Ω**

9. Ignition ON.
10. Verify a test lamp illuminates between the ignition circuit terminal 3 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

10.1. Ignition OFF.

10.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

10.1. Ignition OFF.

10.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K41R Rear Parking Assist Control Module.

11. Vehicle OFF. Place an object less than 0.4m away from the rear bumper. Connect a test lamp between reference voltage terminal 1 and control circuit terminal 2.

12. Verify the test lamp illuminates when the vehicle is started and the transmission is shifted into reverse.

⇒ **If the test lamp does not illuminate**

12.1. Vehicle OFF.

12.2. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K41R Rear Parking Assist Control Module.

⇓ **If the test lamp illuminates**

13. Test or replace the P28 Speaker – Parking Assist.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the diagnostic procedure.

- *Rear Parking Assist Alarm Sensor Replacement on page 12-51*
- *Control Module References on page 6-3* for Rear Parking Assist Control Module replacement, setup and programming.

Pedestrian Alert System Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	1	1	-	-
Signal +	B010E 1B	B010E 04	1	-
Signal –	B010E 1B	B010E 04	1	-
Ground	-	1	-	-
1. Pedestrian Alert System Inoperative				

Circuit/System Description

Due to the lack of audible engine noise, hybrid and electric vehicles are very quiet at low speeds. The pedestrian alert system emits an audible sound at speeds less than 34 km/h (21 MPH) to alert pedestrians that the vehicle is approaching. The sound will fade in and out and vary in pitch depending on vehicle speed. The K132 Pedestrian Alert Sound Control Module is supplied with B+ and ground. It communicates using serial data. The module outputs a signal to the P48 Pedestrian Alert Sound Speaker.

Reference Information

Schematic Reference

Object Detection Schematics on page 12-36

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Object Detection Description and Operation (with park assist, UD7) on page 12-52 or *Object Detection Description and Operation (with rearview camera, UVC) on page 12-53*

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the Pedestrian Alert Sound System parameter is not Disabled.

⇒ **If Pedestrian Alert Sound System is Disabled**

Enable system using the driver information center.

⇓ **If Pedestrian Alert Sound System is not Disabled**

3. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K132 Pedestrian Alert Sound Control Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 3 and ground.

⇒ **If 10 Ω or greater**

2.1. Ignition OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Verify a test lamp illuminates between the B+ circuit terminal 10 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

3.1. Ignition OFF.

3.2. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

3.1. Ignition OFF.

3.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K132 Pedestrian Alert Sound Control Module.

⇓ **If the test lamp illuminates**

4. Ignition ON.
5. Verify a test lamp illuminates between the ignition circuit terminal 4 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

5.1. Ignition OFF.

5.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

5.1. Ignition OFF.

5.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K132 Pedestrian Alert Sound Control Module.

⇓ **If the test lamp illuminates**

6. Ignition OFF, connect the harness connector at the K132 Pedestrian Alert Sound Control Module, disconnect the harness connector at the P48 Pedestrian Alert Sound Speaker. Ignition ON,
7. Test for less than 10 Ω between the low reference circuit terminal 2 and ground.

⇒ **If 10 Ω or greater**

7.1. Ignition OFF.

7.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the ground circuit.

⇒ If less than 2 Ω, replace the K132 Pedestrian Alert Sound Control Module.

⇓ **If less than 10 Ω**

8. Test for 3.5–5.5 V between signal circuit terminal 1 and terminal 2 and low reference.

⇒ **If less than 3.5 V**

8.1. Ignition OFF, disconnect the harness connector at the K132 Pedestrian Alert Sound Control Module.

8.2. Test for infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

8.3. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K132 Pedestrian Alert Sound Control Module.

⇒ **If greater than 5.5 V**

8.1. Ignition OFF, disconnect the harness connector at the K132 Pedestrian Alert Sound Control Module. Ignition ON.

8.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K132 Pedestrian Alert Sound Control Module.

⇓ **If between 3.5–5.5 V**

9. Test or replace the P48 Pedestrian Alert Sound Speaker.
10. Verify proper operation of the Pedestrian Alert Sound System.

⇒ **If the system does not operate properly**

Replace the K132 Pedestrian Alert Sound Control Module.

⇓ **If the system operate properly**

11. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Pedestrian Sound Alert Speaker Replacement on page 12-49*
- *Control Module References on page 6-3* for pedestrian sound alert module replacement, programming and setup.

Rear Vision Camera System Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	1	1	—	—
Ground	—	1	—	—
Backup Signal	1	1	2	—
Shield	3	3	3	—
Camera Module signal +	3	1	1	—
Camera Module signal –	3	1	1	—
1. Rear Vision Camera no image displayed 2. Rear Vision Camera image always displayed 3. Poor Quality Image				

Circuit/System Description

When the transmission is placed into REVERSE, a 12 V signal is sent to the rearview camera indicating that camera operation is requested. Ignition voltage and ground are supplied to the rearview camera. The rearview camera sends video information to the radio through a video signal + and a video signal − circuit. A grounded shielding also wraps the video signal circuits to reduce electronic interference which may degrade the video signal and cause a distorted or otherwise degraded image.

Diagnostic Aids

A poor video image can be caused by ice, snow, and mud buildup on the lens of the rearview camera. Also, extreme lighting conditions can affect performance, such as operating in the dark or with bright sunlight shining on the camera. Extreme high or low temperatures can also affect the image quality. An open in the shield of the video signal circuit can also cause a distorted screen.

Reference Information

Schematic Reference

Object Detection Schematics on page 12-36

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Object Detection Description and Operation (with park assist, UD7) on page 12-52 or *Object Detection Description and Operation (with rearview camera, UVC) on page 12-53*

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Circuit/System Verification

1. Ignition ON.
2. Verify there is no debris on the rearview camera lens and that the bezel and bezel seal are not damaged.

⇒ **If debris are found on the lens**

Clean the lens. If the lens, bezel, or bezel seal are damaged, replace as necessary.

⇓ **If no debris on the lens**

3. Engine running, transmission in REVERSE.
4. Verify the backup lamps are On.

⇒ **If the backup lamps are not ON**

Refer to *Backup Lamps Malfunction on page 4-142*.

⇓ **If the backup lamps are ON**

5. Engine running, transmission in REVERSE.
6. Verify a clear rear vision image is displayed on the radio.

⇒ **If a clear image is not displayed**

Refer to Circuit/System Testing.

⇓ **If a clear image is displayed**

7. All OK.

Circuit/System Testing

Note: Circuit/System Verification must be performed before Circuit/System Testing.

1. Ignition OFF, disconnect the harness connector at the B87 Rearview Camera.
2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.

⇒ **If 10 Ω or greater**

2.1. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

4.1. Ignition OFF.

4.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse. Refer to *Power Mode Mismatch on page 11-857*.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

4.1. Ignition OFF.

4.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the B87 Rearview Camera.

⇓ **If the test lamp illuminates**

5. Engine running, park brake applied, transmission in REVERSE.
6. Verify a test lamp illuminates between the control circuit terminal 3 and ground.

⇒ **If the test lamp does not illuminate**

6.1. Ignition OFF, disconnect the X7 harness connector at the K9 Body Control Module.

6.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

7. Ignition OFF, disconnect the X1 harness connector at the A11 Radio, ignition ON.
8. Test for less than 1 V between the signal circuit terminal listed below and ground:
   - B87 Rearview Camera signal (+) circuit terminal 1.
   - B87 Rearview Camera signal (–) circuit terminal 4.

⇒ **If 1 V or greater**

Repair the short to voltage on the circuit.

⇓ **If less than 1 V**

9. Test for infinite resistance between the signal circuit terminal listed below and ground:
   - B87 Rearview Camera signal (+) circuit terminal 1.
   - B87 Rearview Camera signal (–) circuit terminal 4.

⇒ **If less than infinite resistance**

Repair the short to ground on the circuit.

⇓ **If infinite resistance**

10. Test for less than 2 Ω in the signal circuits listed below end to end:
    - B87 Rearview Camera signal (+) circuit terminal 1 to A11 Radio X1, terminal 7
    - B87 Rearview Camera signal (–) circuit terminal 4 to A11 Radio X1, terminal 8

⇒ **If 2 Ω or greater**

Test the appropriate signal circuit for an open/ high resistance.

⇓ **If less than 2 Ω**

11. Replace the B87 Rearview Camera.
12. Engine running, transmission in REVERSE.
13. Verify a clear rear vision image is displayed on the driver information display.

⇒ **If a clear rear vision image is not displayed**

Test or replace the A11 Radio.

⇓ **If a clear rear vision image displayed**

14. All Ok.

Repair Instructions

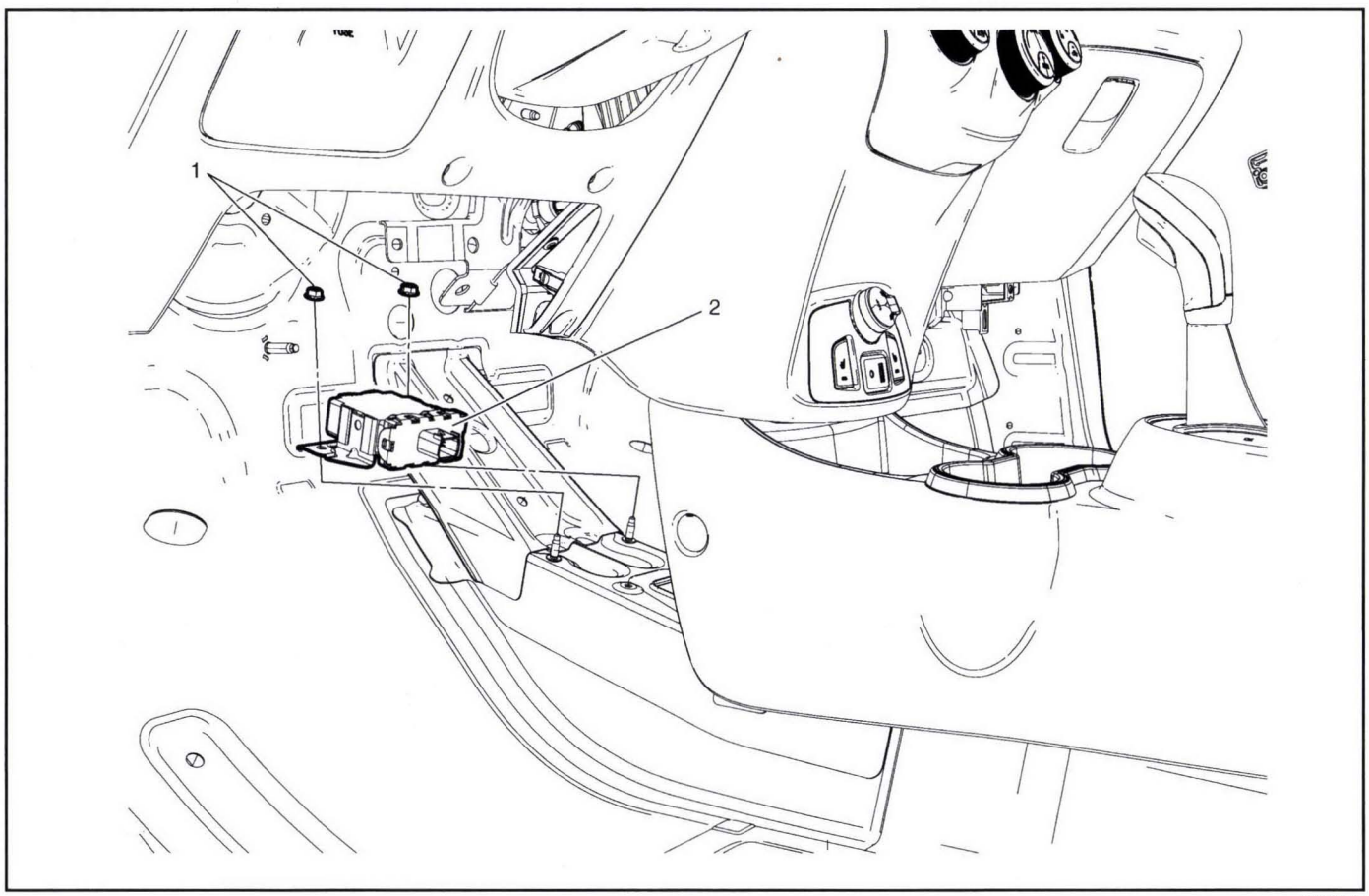
Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Rearview Camera Image Display Module Replacement on page 12-52*
- *Control Module References on page 6-3* for radio replacement, programming, and setup

---

Repair Instructions

Pedestrian Sound Alert Module Replacement

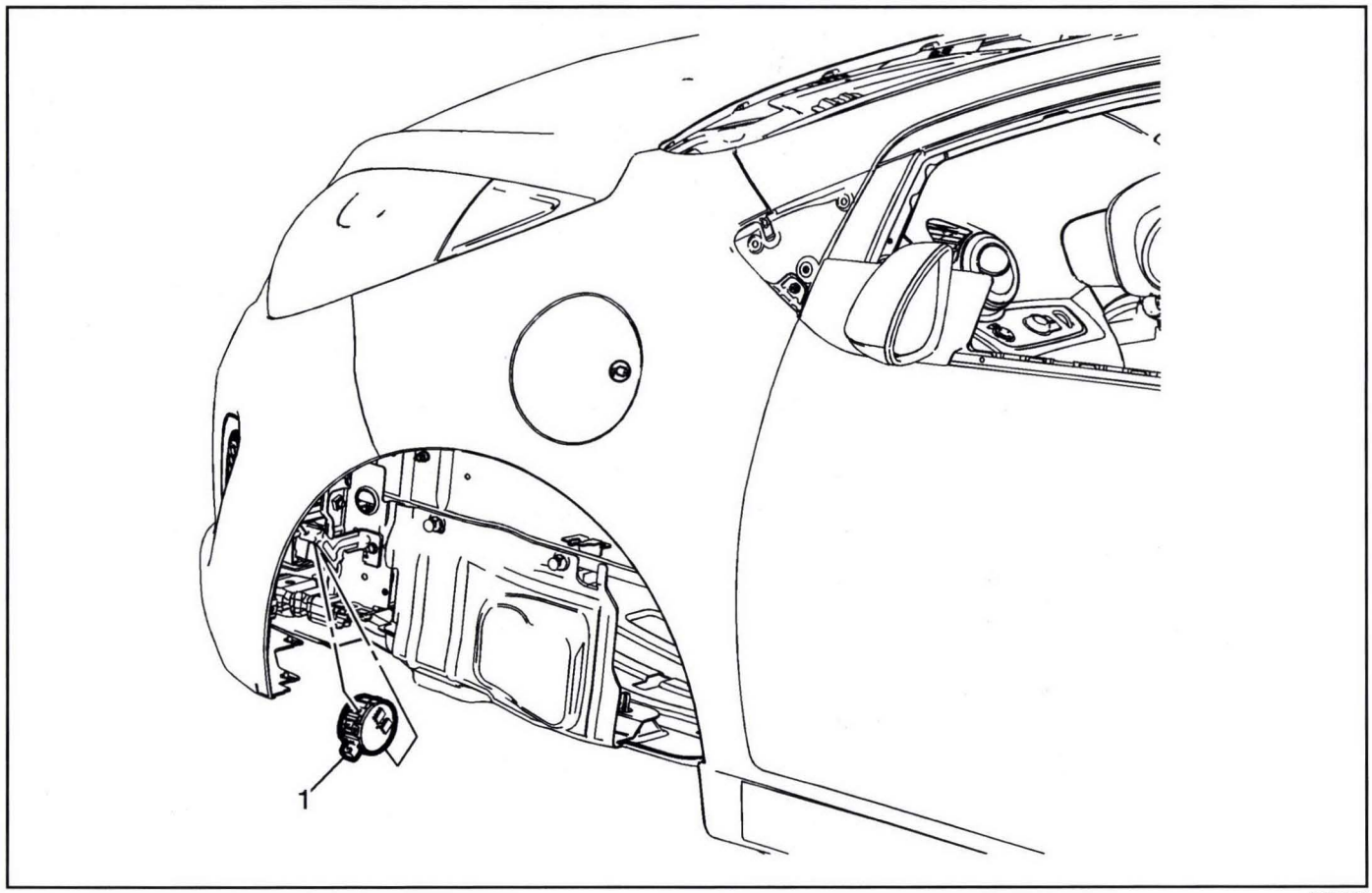


3217829

Pedestrian Sound Alert Module Replacement

Callout	Component Name
Preliminary Procedure To access the module, open the carpet covering the module from side to side.	
1	Pedestrian Sound Alert Module Nuts (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 10 N•m (89 lb in)
2	Pedestrian Sound Alert Module **Procedure** 1. Disconnect the electrical connector. 2. Remove the module and bracket as an assembly.

Pedestrian Sound Alert Speaker Replacement

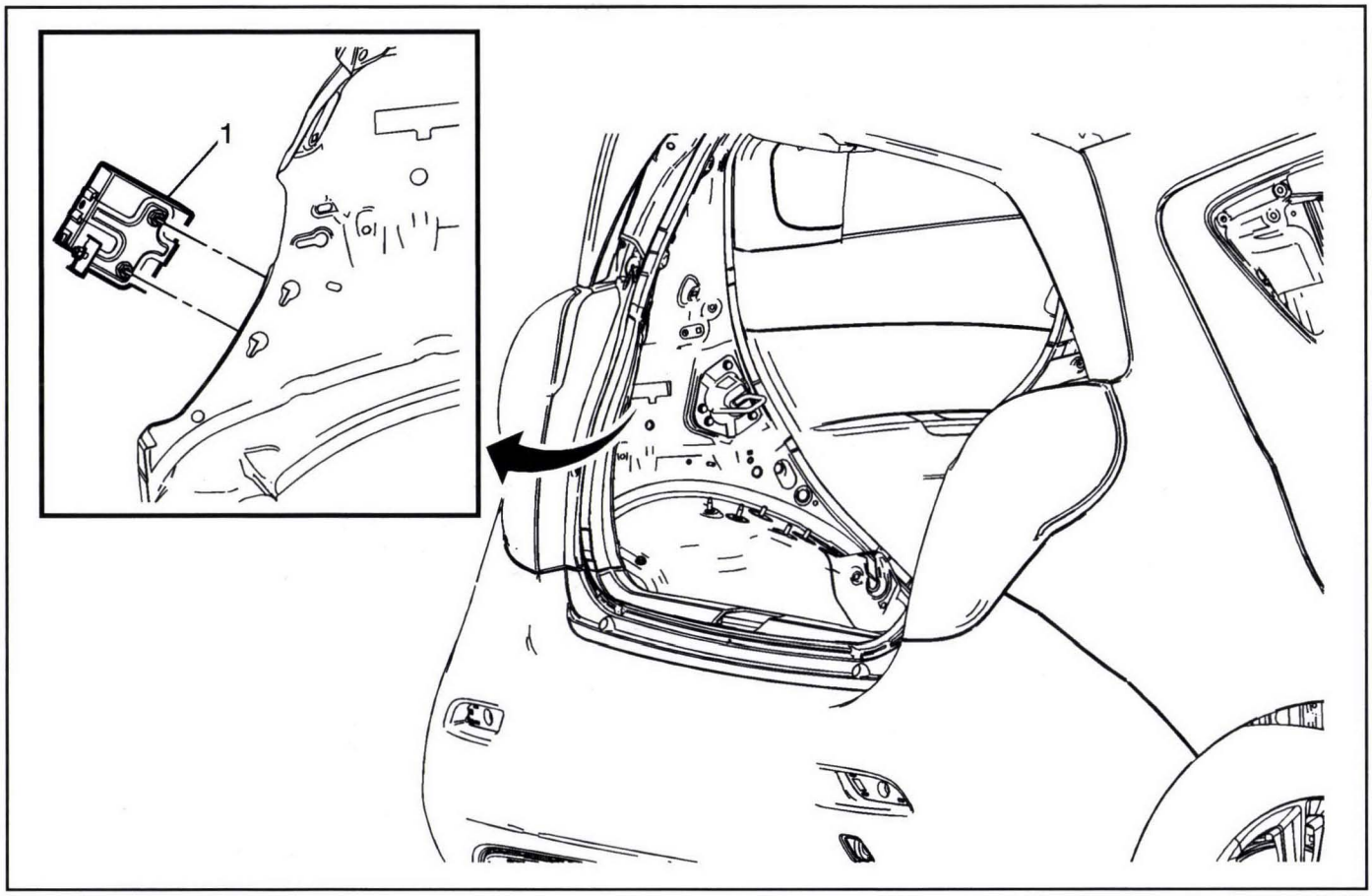


3217831

Pedestrian Sound Alert Speaker Replacement

Callout	Component Name
Preliminary Procedure Remove the left front wheel house liner. Refer to *Front Wheelhouse Liner Replacement - Left Side on page 3-139*.	
1	Pedestrian Sound Alert Speaker **Procedure** 1. Disconnect the electrical connector. 2. Depress tabs on speaker to release from bracket.

Parking Assist Control Module Replacement



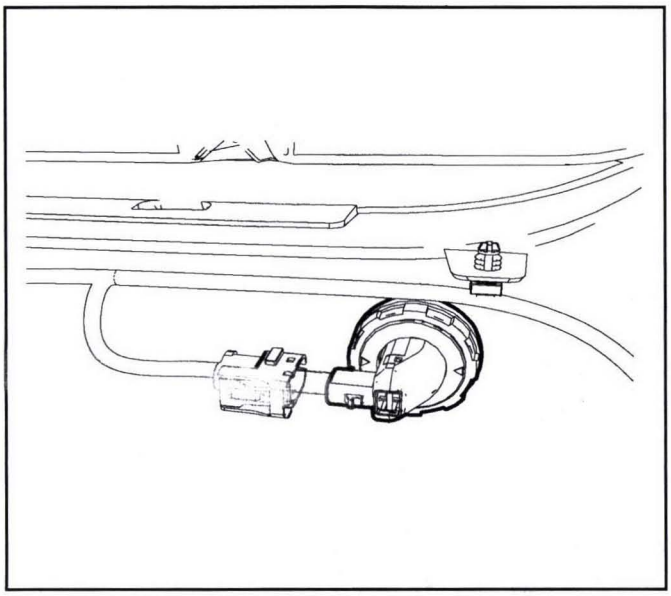
3222694

Parking Assist Control Module Replacement

Callout	Component Name
Preliminary Procedure Remove the right side quarter lower rear trim panel. Refer to *Quarter Lower Rear Trim Panel Replacement on page 2-65*.	
1	Rear Object Alarm Control Module **Procedure** 1. Disconnect the electrical connections. 2. Slide module from quarter inner rear wheelhouse panel. 3. Refer to *Control Module References on page 6-3* for programming and setup information.

Rear Parking Assist Alarm Sensor Replacement

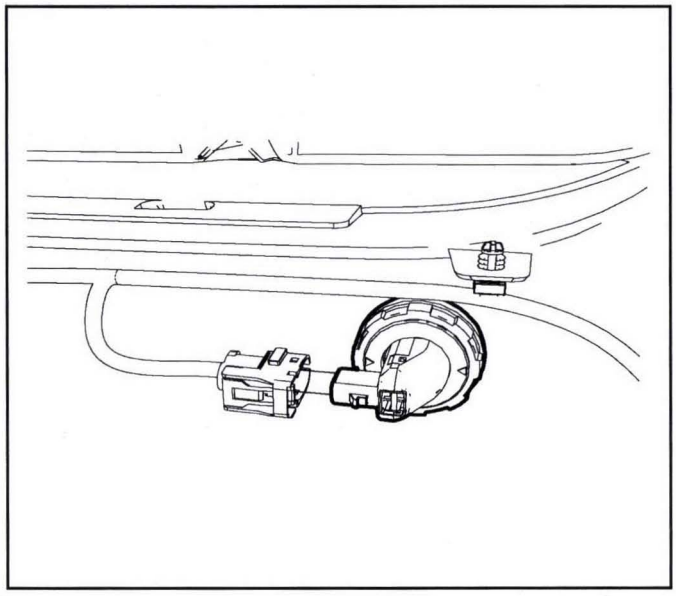
Removal Procedure



2327692

1. Remove the rear bumper fascia. Refer to *Rear Bumper Fascia Replacement on page 3-63*.
2. Disconnect electrical connector from the rear object sensor.
3. Rotate the housing counterclockwise and remove the rear object sensor.

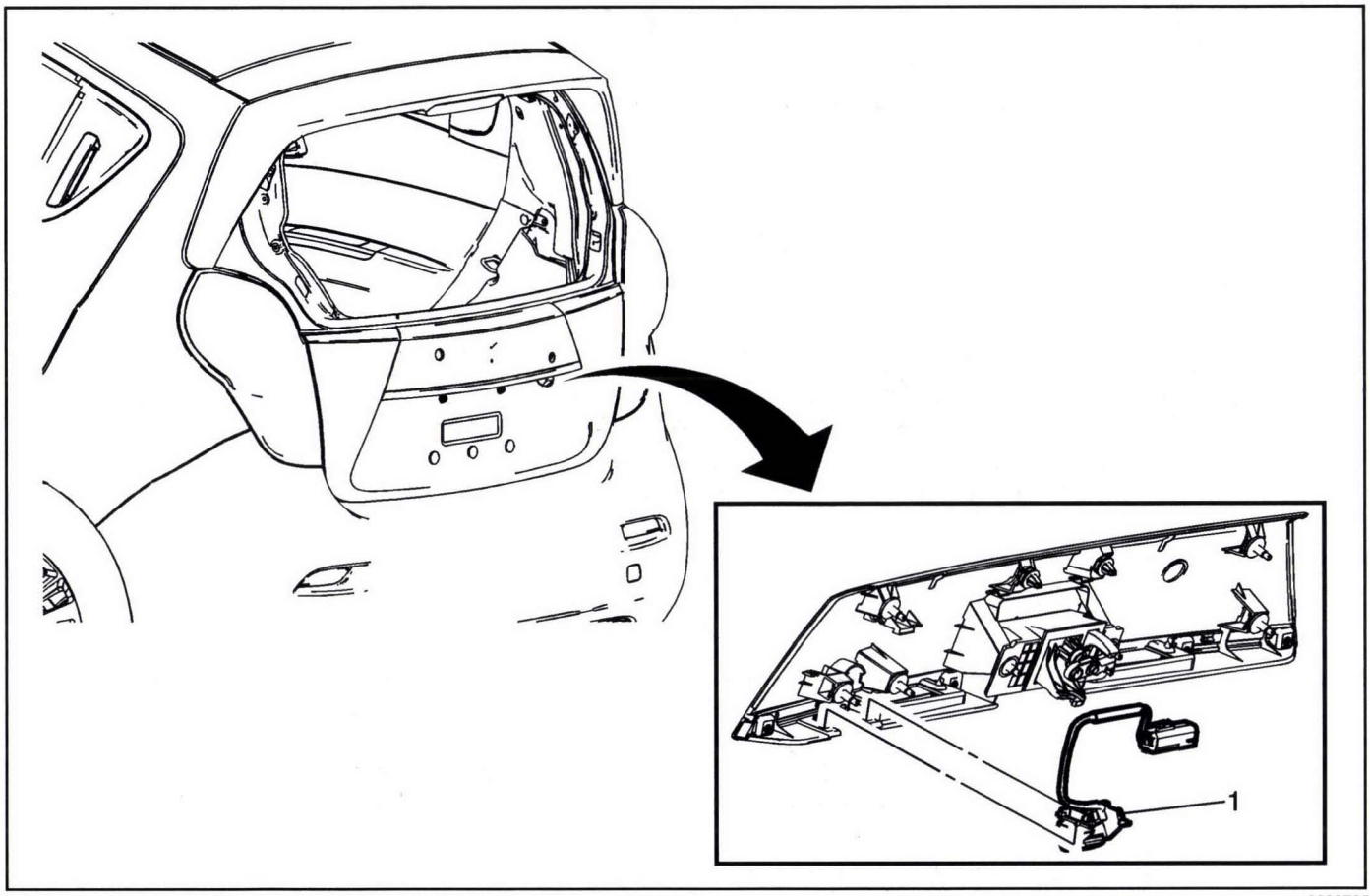
Installation Procedure



2327692

1. Insert the sensor into the housing and lock the sensor by rotating the housing clockwise.
2. Connect the electrical connector to the rear object sensor.
3. Install the rear bumper fascia. Refer to *Rear Bumper Fascia Replacement on page 3-63*.

Rearview Camera Image Display Module Replacement



3222705

Rearview Camera Image Display Module Replacement

Callout	Component Name
Preliminary Procedure Remove the liftgate outside handle. Refer to *Liftgate Outside Handle Replacement on page 4-264*.	
1	Rearview Camera Image Display Module **Procedure** 1. Disconnect the electrical connector. 2. Depress the clip fingers and push outward to remove the rearview camera from the applique.

Description and Operation

Object Detection Description and Operation (with park assist, UD7)

Object Detection Description and Operation (Parking Assist)

The ultrasonic parking assist system is designed to identify and notify the driver of an object in the vehicle's path when reversing. The distance and location of the object is determined by 2 Rear Object Sensors located in the rear bumper. The Rear Parking Assist Control Module will notify the driver using an audible beep signal through an external speaker.

Object Detection Components

The parking assist system is made up of the following components:

- K41R Rear Parking Assist Control Module
- Two Rear Object Sensors

Rear Parking Assist Control Module

The object alarm module provides an 8V reference and a low reference to the Rear Object Sensors. The Rear Parking Assist Control Module receives individual signals from each of the sensors and determines the location and distance of an object based on these inputs. When an object is detected, the Rear Parking Assist Control Module will send a signal to an external speaker to provide an audible alert.

Rear Object Sensors

The Rear Object Sensors are located in the rear bumper of the vehicle. The sensors are used to determine the distance between an object and the bumper. Each sensor emits an ultrasonic frequency which is reflected off any object located in front of or behind the vehicle. These reflections are received by the sensors. The time difference between the emission of the frequency and when the reflection is received is known as sensor ring time, it is used to determine the distance to the object. The sensors report this information to the Rear Parking Assist Control Module.

Parking Assist Operation

When an object is within the measuring range of the sensor, the ultrasonic pulse is reflected and is received by the sending or a neighboring sensor. The sensor converts this signal into a voltage signal and sends this signal to the Rear Parking Assist Control Module. The Rear Parking Assist Control Module evaluates the received sensor signals. As soon as an object is within the measuring range, the Rear Parking Assist Control Module sends a signal to an external speaker in order to give out the acoustic distance signal. The measuring range is between 40–120 cm (15.74–47.24 in). From a distance of 120 cm (15.74 in), the acoustic signal is active. The frequency of the beep sound increases with decreasing distance. From a distance less than 40 cm (15.74 in), the sound becomes continuous.

The parking assist can be activated and deactivated by engaging the reverse gear.

The object alarm module carries out a self test and monitors the sensors for electrical and mechanical faults. Monitored is the power supply of each sensor and the sensor signals, which need to alter when the vehicle moves. If this is not the case, the sensor is acoustically blocked or faulty. Mud, ice and snow may cause obstruction of the function of the sensors. The Rear Parking Assist Control Module will also check whether the correct type of sensor is installed.

Object Detection Description and Operation (with rearview camera, UVC)

Rear Vision Camera System Operation

The rear vision camera system consists of a video camera/module located at the rear of the vehicle and the infotainment display.

When the transmission is placed into REVERSE, a 12 volt signal is sent to the rear vision camera by the body control module (BCM). This signal indicates to the camera that the vehicle is in reverse and image display is requested. The rear vision camera receives ignition voltage and a constant ground to power the camera. Video signal + and video signal – circuits carry the video image from the rear vision camera to the infotainment display. Additionally, the video signal circuits are shielded to prevent any interference which may lead to a loss of video signal resolution and a degraded video image. The shield is provided a ground path by the rear vision camera.

The following conditions may cause a degraded rear vision camera image:

- Ice, snow, or mud has built up on the rear vision camera
- Dark conditions
- Extreme light conditions, such as glare from the sun or the headlights of another vehicle
- Damage to the rear of the vehicle
- Extreme high temperatures or extreme temperature changes

If a malfunction is detected in the system, Service Rear Vision Camera may be displayed on the infotainment display as an indicator to the customer that a problem exists that requires service.

Remote Functions

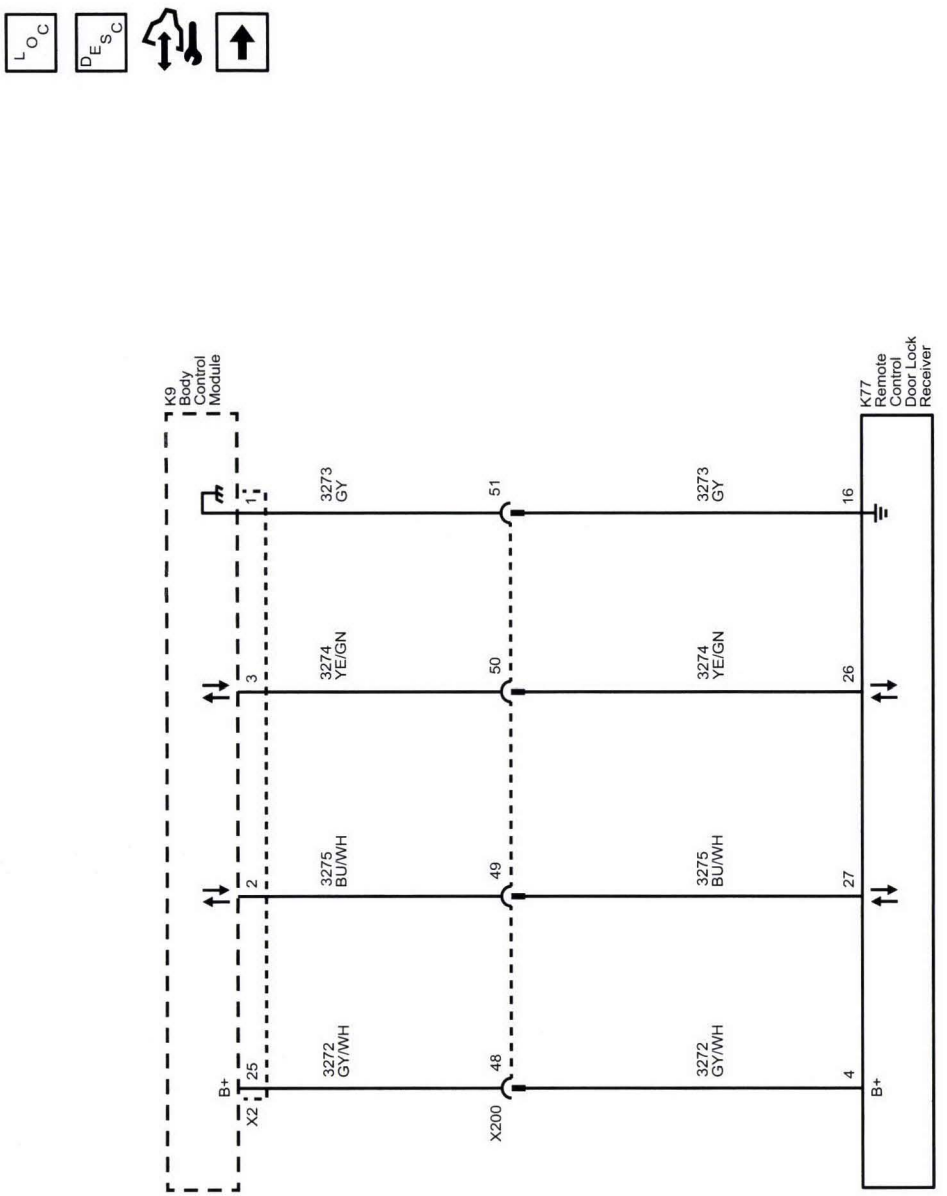
Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Keyless Entry Control Module Bracket Fastener	9 N•m	80 lb in
Remote Control Door Lock Receiver Nut	8 N•m	71 lb in

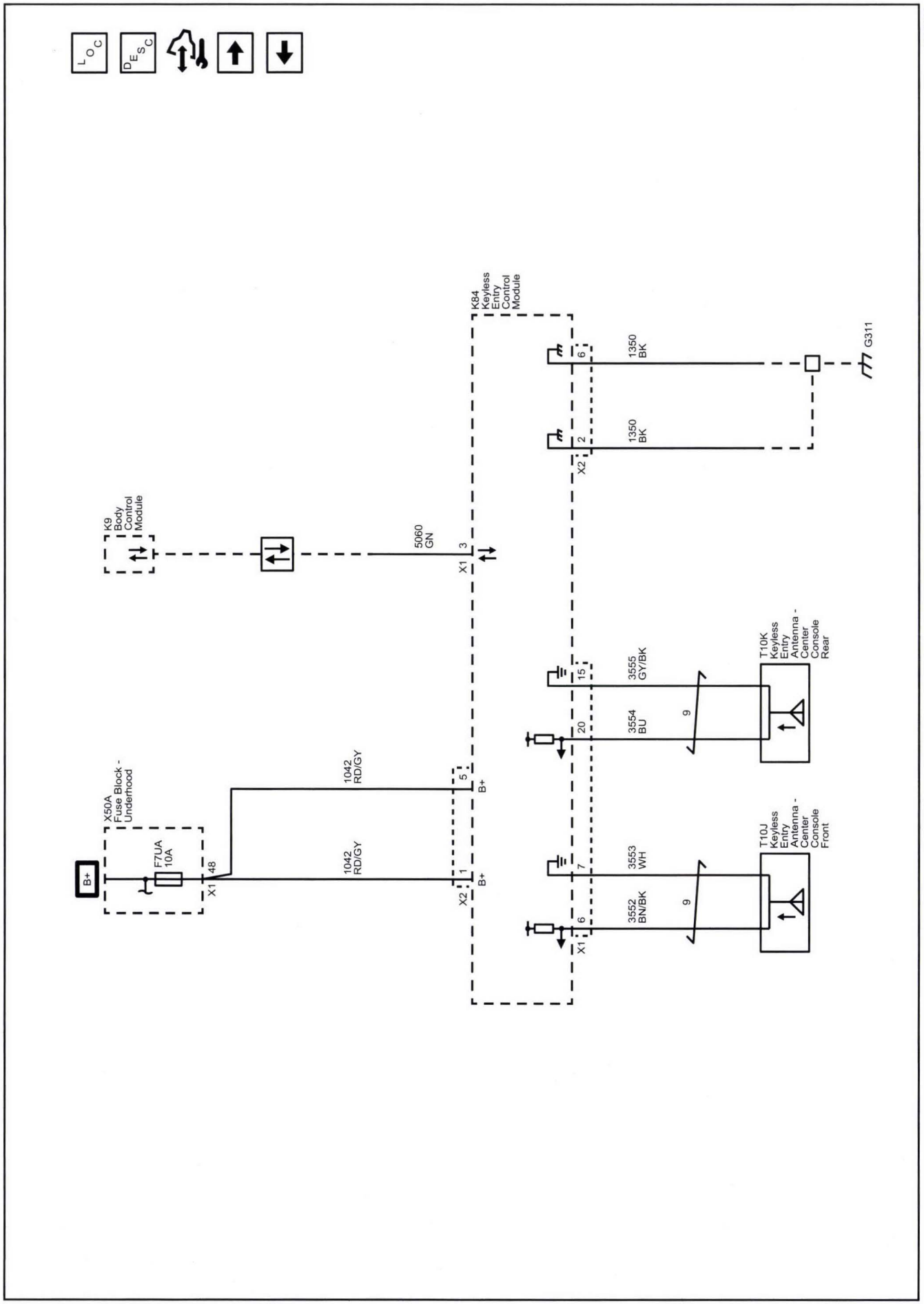
Schematic and Routing Diagrams

Remote Function Schematics (Keyless Entry)



3666282

Remote Function Schematics (Passive Start (BTM))



Diagnostic Information and Procedures

DTC B3101

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B3101: Keyless Entry Data Link Circuit

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	B3101 00	B3101 00	—	—
Serial Data – Enable Line	B3101 00	B3101 00	B3101 00	B3101 00
Serial Data – Receive	B3101 00	B3101 00	B3101 00	B3101 00
Low Reference	—	B3101 00	—	—

Circuit/System Description

The body control module communicates with the remote control door lock receiver through the keyless entry serial data circuits. When any button on the keyless entry transmitter is pressed, the transmitter sends a signal to the remote control door lock receiver. The remote control door lock receiver sends a function request to the body control module, depending on which button is pressed on the transmitter. The body control module receives the message and performs the appropriate function.

Conditions for Running the DTC

The body control module monitors for this DTC at all times.

Conditions for Setting the DTC

No response is received from the remote control door lock receiver after the body control module requests information from or sends configuration commands to the remote control door lock receiver.

Action Taken When the DTC Sets

In the case of power loss, the remote control door lock receiver is disabled for 65 s. Otherwise no action is taken.

Conditions for Clearing the DTC

- A current DTC will clear when the fault is no longer present.
- A history DTC will clear after 40 consecutive ignition cycles without a fault present.

Reference Information

Schematic Reference

Remote Function Schematics on page 12-55

Component Connector End Views

Component Connector End Views on page 11-455

Description and Operation

Keyless Entry System Description and Operation on page 12-79

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, scan tool disconnected, disconnect the harness connector at the K77 Remote Control Door Lock Receiver. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 30 Ω between the low reference circuit terminal 1 and ground.

⇒ **If 30 Ω or greater**

2.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.

2.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If less than 30 Ω**

3. Ignition ON.
4. Test for greater than 11.5 V between the B+ circuit terminal 4 and ground.

⇒ **If 11.5 V or less**

4.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If Infinite resistance.

4.3. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If greater than 11.5 V**

5. Test for 1–6 V between the serial data circuit terminal 2 and ground.

⇒ **If less than 1 V**

5.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.

5.2. Test for infinite resistance between the serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

5.3. Test for less than 2 Ω in the serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If greater than 6 V**

5.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module, ignition ON.

5.2. Test for less than 1 V between the serial data circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If between 3–6 V**

6. Ignition OFF, disconnect the X1 and X2 harness connectors at the K9 Body Control Module, ignition ON.
7. Test for less than 1 V between the K9 Body Control Module serial data circuit terminal 26 X1 and ground.

⇒ **If 1 V or greater**

Repair the short to voltage on the circuit.

⇓ **If less than 1 V**

8. Ignition OFF.
9. Test for infinite resistance between the K9 Body Control Module serial data circuit terminal 26 X1 and ground.

⇒ **If less than infinite resistance**

Repair the short to ground on the circuit.

⇓ **If infinite resistance**

10. Test for less than 2 Ω between the K9 Body Control Module serial data circuit terminal 26 X1 and the K77 Remote Control Door Lock Receiver serial data circuit terminal 3.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

⇓ **If less than 2 Ω**

11. Replace the K77 Remote Control Door Lock Receiver.
12. Verify DTC B3101 does not set while operating the vehicle under the conditions for running the DTC.

⇒ **If the DTC sets**

Replace the K9 Body Control Module

⇓ **If the DTC does not set**

13. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for body control module or remote control door lock receiver replacement, programming, and setup.

DTC B3105

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B3105: Keyless Entry Transmitters

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The body control module monitors the number of keyless entry transmitters programmed. Until at least one transmitter is programmed, the body control module determines a malfunction condition exists.

Conditions for Running the DTC

The body control module has been set up without transmitters being programmed.

Conditions for Setting the DTC

No keyless entry transmitter programmed to the body control module.

Action Taken When the DTC Sets

The keyless entry system is inoperative.

Conditions for Clearing the DTC

A current DTC is cleared when at least one transmitter has been programmed to the body control module.

Reference Information

Schematic Reference

Remote Function Schematics on page 12-55

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Keyless Entry System Description and Operation on page 12-79

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify that the transmitter is a correct transmitter for the vehicle. This can be accomplished by comparing the part number printed on the transmitter to the appropriate part number in the parts catalog.

⇒ **If the transmitter is incorrect**

Replace the transmitter.

⇓ **If the transmitter is correct**

2. Program the transmitter. Refer to *Key with Integrated Transmitter Programming on page 12-28*.
3. Verify the transmitter has successfully completed the programming procedure.

⇒ **If the transmitter does not program successfully**

Replace the transmitter.

⇓ **If the transmitter programs successfully**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Key with Integrated Transmitter Programming on page 12-28

DTC B3106

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B3106: Keyless Entry Data Link

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

The body control module communicates with the remote control door lock receiver through the keyless entry serial data circuits. When any button on the keyless entry transmitter is pressed, the transmitter sends a signal to the remote control door lock receiver. The remote control door lock receiver sends a function request to the body control module, depending on which button is pressed on the transmitter. The body control module receives the message and performs the appropriate function.

Conditions for Running the DTC

A keyless transmitter button is pressed.

Conditions for Setting the DTC

The transmitter that is sending a signal to the remote control door lock receiver is different from those transmitters stored in the body control module.

Action Taken When the DTC Sets

No action is taken.

Conditions for Clearing the DTC

- A current DTC will clear when the fault is no longer present and the ignition switch is cycled.
- A history DTC will clear after 40 consecutive ignition cycles without a fault present.

Reference Information

Schematic Reference

Remote Function Schematics on page 12-55

Component Connector End Views

Component Connector End Views on page 11-455

Description and Operation

Keyless Entry System Description and Operation on page 12-79

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. With a valid and learned transmitter, press and release a button on the transmitter.
2. Verify that DTC B3106 is not set.

⇒ **If DTC B3106 is set**

Replace the K77 Remote Control Door Lock Receiver.

⇓ **If DTC B3106 is not set**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for remote control door lock receiver replacement, programming, and setup.

DTC B3109-B3113

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B3109: Keyless Entry Transmitter 1 Battery
DTC B3110: Keyless Entry Transmitter 2 Battery
DTC B3111: Keyless Entry Transmitter 3 Battery
DTC B3112: Keyless Entry Transmitter 4 Battery
DTC B3113: Keyless Entry Transmitter 5 Battery

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

With each press of a keyless entry transmitter button, a message containing the current battery state of the transmitter is sent to the remote control door lock receiver, along with the commanded keyless entry function. The remote control door lock receiver sends this to the body control module to perform the requested function.

Conditions for Running the DTC

A keyless transmitter button is pressed.

Conditions for Setting the DTC

Three consecutive low battery signals are received from the same transmitter.

Action Taken When the DTC Sets

The keyless entry system is inoperative.

Conditions for Clearing the DTC

The DTC is cleared when a normal transmitter voltage signal is received from the transmitter that set the DTC.

Reference Information

Schematic Reference

Remote Function Schematics on page 12-55

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Keyless Entry System Description and Operation on page 12-79

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify none of the DTCs listed below are set:
   - DTC B3109
   - DTC B3110
   - DTC B3111
   - DTC B3112
   - DTC B3113

⇒ **If any of the DTCs are set**

1.1. Replace the battery in the appropriate keyless entry transmitter and operate the transmitter three consecutive times.

1.2. Verify the DTC does not set.

⇒ If the DTC sets, replace the keyless entry transmitter.

⇓ If the DTC does not set

1.3. All OK.

⇓ **If none of the DTCs are set**

2. All OK.

DTC B310D-B310F

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B310D: Keyless Entry Transmitter 6 Battery
DTC B310E: Keyless Entry Transmitter 7 Battery
DTC B310F: Keyless Entry Transmitter 8 Battery

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Circuit/System Description

With each press of a keyless entry transmitter button, a message containing the current battery state of the transmitter is sent to the remote control door lock receiver, along with the commanded keyless entry function. The remote control door lock receiver sends this to the body control module to perform the requested function.

Conditions for Running the DTC

A keyless transmitter button is pressed.

Conditions for Setting the DTC

Three consecutive low battery signals are received from the same transmitter.

Action Taken When the DTC Sets

The keyless entry system is inoperative.

Conditions for Clearing the DTC

The DTC is cleared when a normal transmitter voltage signal is received from the transmitter that set the DTC.

Reference Information

Schematic Reference

Remote Function Schematics on page 12-55

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Keyless Entry System Description and Operation on page 12-79

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify none of the DTCs listed below are set:
   - DTC B310D
   - DTC B310E
   - DTC B310F

⇒ **If any of the DTCs are set**

1.1. Replace the battery in the appropriate keyless entry transmitter and operate the transmitter three consecutive times.

1.2. Verify the DTC does not set.

⇒ If the DTC sets, replace the keyless entry transmitter.

⇓ If the DTC does not set

1.3. All OK.

⇓ **If none of the DTCs are set**

2. All OK.

DTC B3122

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B3122 : Keyless Entry Antenna 4

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Keyless Entry Antenna Signal – Center Console Front	B3122 02	B3122 05	B3122 05	—
Keyless Entry Antenna Low Reference – Center Console Front	—	B3122 05	—	—

Circuit/System Description

The front center console antenna is located under the center console assembly, just behind the transmission control, and is used to establish low frequency communications with the keyless entry transmitter. When the vehicle on/off switch is pressed, the keyless entry control module activates the front center console antenna.

Conditions for Running the DTC

Pressing the vehicle on/off switch.

Conditions for Setting the DTC

B3122 02

The keyless entry control module detects a short to ground on the front center console keyless entry antenna signal circuit.

B3122 05

The keyless entry control module detects a short to B+ or an open on the front center console keyless entry antenna signal circuit.

Action Taken When the DTC Sets

Vehicle will not detect the transmitter in some locations inside the vehicle. If the transmitter is not detected then vehicle will not change modes when the vehicle on/off switch is pressed.

Conditions for Clearing the DTC

- A current DTC will clear when the conditions for setting the DTC are no longer present.
- A history DTC will clear after 40 malfunction-free power mode cycles.

Reference Information

Schematic Reference

Remote Function Schematics on page 12-55

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Keyless Entry System Description and Operation on page 12-79

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Vehicle OFF, disconnect the harness connector at the T10J Keyless Entry Antenna - Center Console Front, vehicle in Service Mode.
2. Test for less than 1 V between the signal circuit terminal 1 and ground.

⇒ **If 1 V or greater**

2.1. Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module, vehicle in Service Mode.

2.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K84 Keyless Entry Control Module.

⇓ **If less than 1 V**

Note: When using the MIN MAX function, autorange on the DMM may not function properly. To ensure accurate test results, turn off autorange and manually set the DMM range to 000.0 V.

3. Vehicle OFF, install a DMM between the signal circuit terminal 1 and ground. Set the DMM to capture DC voltage using the MIN MAX function.
4. Activate the antenna by pressing the S83 Vehicle On/Off Switch.
5. Verify the MAX voltage captured by the DMM is greater than 1 V.

⇒ **If 1 V or less**

5.1. Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module.

5.2. Test for infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

5.3. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K84 Keyless Entry Control Module.

⇓ **If greater than 1 V**

6. Test for less than 1 V between the low reference circuit terminal 2 and ground.

⇒ **If 1 V or greater**

6.1. Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module, vehicle in Service Mode.

6.2. Test for less than 1 V between the low reference circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K84 Keyless Entry Control Module.

⇓ **If less than 1 V**

Note: When using the MIN MAX function, autorange on the DMM may not function properly. To ensure accurate test results, turn off autorange and manually set the DMM range to 000.0 V.

7. Install a DMM between the signal circuit terminal 1 and the low reference circuit terminal 2. Set the DMM to capture DC voltage using the MIN MAX function.
8. Activate the antenna by pressing the S83 Vehicle On/Off Switch.
9. Verify the MAX voltage captured by the DMM is greater than 1 V.

⇒ **If 1 V or less**

9.1. Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module.

9.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K84 Keyless Entry Control Module.

⇓ **If greater than 1 V**

10. Replace the T10J Keyless Entry Antenna - Center Console Front.
11. Activate the antenna by pressing the S83 Vehicle On/Off Switch.
12. Verify DTC B3122 is not set as current.

⇒ **If DTC B3122 is set as current**

Replace the K84 Keyless Entry Control Module.

⇓ **If DTC B3122 is not set or is set as history**

13. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Ignition Lock Key Transmitter Antenna Replacement - Floor Console on page 12-73*
- *Control Module References on page 6-3* for keyless entry control module replacement, programming, and setup

DTC B3123

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B3123 02: Keyless Entry Antenna 5

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Keyless Entry Antenna Signal – Rear	B3123 02	B3123 05	B3123 05	—
Keyless Entry Antenna Low Reference – Rear	—	B3123 05	—	—

Circuit/System Description

The eear antenna is located under the rear seat. The antenna is used to establish low frequency communications with the keyless entry transmitter. When the driver presses the vehicle on/off switch, the keyless entry control module communicates with the rear antenna.

Conditions for Running the DTC

Pressing the vehicle on/off switch.

Conditions for Setting the DTC

B3123 02

The keyless entry control module detects a short to ground on the rear keyless entry antenna signal circuit.

B3123 05

The keyless entry control module detects a short to B+ or an open on the rear keyless entry antenna signal circuit.

Action Taken When the DTC Sets

The vehicle will not detect the transmitter in some locations inside the vehicle. If the transmitter is not detected then vehicle will not change modes when the vehicle on/off switch is pressed.

Conditions for Clearing the DTC

- A current DTC will clear when the conditions for setting the DTC are no longer present.
- A history DTC will clear after 40 malfunction-free power mode cycles.

Reference Information

Schematic Reference

Remote Function Schematics on page 12-55

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Keyless Entry System Description and Operation on page 12-79

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Vehicle OFF, disconnect the harness connector at the T10K Keyless Entry Antenna - Center Console Rear , vehicle in Service Mode.
2. Test for less than 1 V between the signal circuit terminal 1 and ground.

⇒ **If 1 V or greater**

2.1. Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module, vehicle in Service Mode.

2.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K84 Keyless Entry Control Module.

⇓ **If less than 1 V**

Note: When using the MIN MAX function, autorange on the DMM may not function properly. To ensure accurate test results, turn off autorange and manually set the DMM range to 000.0 V.

3. Vehicle OFF, install a DMM between the signal circuit terminal 1 and ground. Set the DMM to capture DC voltage using the MIN MAX function.
4. Activate the antenna by pressing the S83 Vehicle On/Off Switch.
5. Verify the MAX voltage captured by the DMM is greater than 1 V.

⇒ **If 1 V or less**

5.1. Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module.

5.2. Test for infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

5.3. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K84 Keyless Entry Control Module.

⇓ **If greater than 1 V**

6. Test for less than 1 V between the low reference circuit terminal 2 and ground.

⇒ **If 1 V or greater**

6.1. Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module, vehicle in Service Mode.

6.2. Test for less than 1 V between the low reference circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K84 Keyless Entry Control Module.

⇓ **If less than 1 V**

Note: When using the MIN MAX function, autorange on the DMM may not function properly. To ensure accurate test results, turn off autorange and manually set the DMM range to 000.0 V.

7. Install a DMM between the signal circuit terminal 1 and the low reference circuit terminal 2. Set the DMM to capture DC voltage using the MIN MAX function.
8. Activate the antenna by pressing the S83 Vehicle On/Off Switch.
9. Verify the MAX voltage captured by the DMM is greater than 1 V.

⇒ **If 1 V or less**

9.1. Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module.

9.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K84 Keyless Entry Control Module.

⇓ **If greater than 1 V**

10. Replace the T10K Keyless Entry Antenna - Center Console Rear .
11. Activate the antenna by pressing the S83 Vehicle On/Off Switch.
12. Verify DTC B3123 is not set as current.

⇒ **If DTC B3123 is set as current**

Replace the K84 Keyless Entry Control Module.

⇓ **If DTC B3123 is not set or is set as history**

13. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Ignition Lock Key Transmitter Antenna Replacement - Rear Compartment on page 12-74*
- *Control Module References on page 6-3* for keyless entry control module replacement, programming, and setup

Symptoms - Remote Functions

Important: The following steps must be completed before using the symptom tables.

1. Perform *Diagnostic System Check - Vehicle on page 6-91* before using the Symptom Tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to *Keyless Entry System Description and Operation on page 12-79*.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the Keyless Entry System. Refer to *Checking Aftermarket Accessories on page 11-871*.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

Keyless Entry System Malfunction on page 12-69

No Remote Detected

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Keyless Entry Antenna Signal – Front Console	B3122 02	B3122 05	B3122 05	—
Keyless Entry Antenna Low Reference – Front Console	—	B3122 05	B3122 05	—
Keyless Entry Antenna Signal – Rear	B3123 02	B3123 05	B3123 05	—
Keyless Entry Antenna Low Reference – Rear	—	B3123 05	B3123 05	—

Circuit/System Description

When a transmitter authentication is requested, the front console and rear antennas simultaneously broadcast a challenge within the passenger compartment to the transmitter. If the response from the transmitter via radio frequency (RF) is a valid response, the body control module (BCM) determines there is a transmitter within the vehicle. If no response is received, the BCM determines that no transmitter is in the vehicle, and NO REMOTE DETECTED will be displayed on the DIC.

Diagnostic Aids

A low transmitter battery or radio frequency (RF) interference from aftermarket devices such as 2-way radios, power inverters, cellular phone chargers, computers, etc. may cause a system malfunction. High RF traffic areas, such as gas stations which use pay-at-the-pump RF transponders, may also cause interference that could lead to a malfunction.

Conditions caused by external influences such are these are considered to be normal. Following this diagnostic will not diagnose an RF interference condition. If RF interference is suspected, question the customer about the conditions or location where the NO REMOTE DETECTED condition occurs.

Reference Information

Schematic Reference

Remote Function Schematics on page 12-55

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Keyless Entry System Description and Operation on page 12-79

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note: This condition may be caused by low vehicle battery voltage. If the battery is not sufficiently charged (above 10 volts), the system will have difficulties detecting the fob and the NO REMOTE DETECTED message will be displayed. Correct the low battery voltage condition to eliminate this condition.

1. Verify that DTC B3122 or B3123 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If none of the DTCs are set**

2. Verify the vehicle starts with the key inserted in the key slot.

⇒ **If the vehicle does not start**

Perform the *Key with Integrated Transmitter Programming on page 12-28* procedure.

⇓ **If the vehicle starts**

3. Verify the NO REMOTE DETECTED message is not displayed on the DIC while attempting to start the vehicle, placing the keyless entry transmitter in various locations within the vehicle interior at each start attempt. The vehicle should start.

⇒ **If the NO REMOTE DETECTED message is displayed at any time**

Refer to Circuit/System Testing.

⇓ **If the NO REMOTE DETECTED message is not displayed and the vehicle starts**

4. Inspect for any sources of RF interference such as cell phone chargers, power supplies, etc. that would interrupt transmitter and antenna communication. If inspection does not reveal any items causing RF interference, discuss with the customer the conditions or location where the NO REMOTE DETECTED condition occurs. Discuss any devices that are normally kept in the vehicle, such as a laptop or cell phone charger, which may have been removed when the vehicle was brought in for service. It may be necessary to explain to the customer how RF interference degrades the performance of the system.

Circuit/System Testing

Note: To determine the appropriate T10 Keyless Entry Antenna to disconnect and diagnose, place the transmitter in various location within the vehicle's interior and attempt to start. The location of the transmitter when the NO REMOTE DETECTED message occurs will correspond with the T10 Keyless Entry Antenna that requires diagnosis.

1. Vehicle OFF, disconnect the harness connector at the appropriate T10 Keyless Entry Antenna, Vehicle in Service Mode.
2. Test for less than 1 V between the signal circuit terminal 1 and ground.

⇒ **If 1 V or greater**

2.1. Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module, Vehicle in Service Mode.

2.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K84 Keyless Entry Control Module.

⇓ **If less than 1 V**

Note: When using the MIN MAX function, autorange on the DMM may not function properly. To ensure accurate test results, turn off autorange and manually set the DMM range to 000.0 V.

3. Vehicle OFF, install a DMM between the signal circuit terminal 1 and ground. Set the DMM to capture DC voltage using the MIN MAX function.
4. Activate the antenna by pressing the ignition mode switch.
5. Verify the MAX voltage captured by the DMM is greater than 1 V.

⇒ **If 1 V or less**

5.1. Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module.

5.2. Test for infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

5.3. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K84 Keyless Entry Control Module.

⇓ **If greater than 1V**

6. Test for less than 1 V between the low reference circuit terminal 2 and ground.

⇒ **If 1 V or greater**

6.1. Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module, Vehicle in Service Mode.

6.2. Test for less than 1 V between the low reference circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K84 Keyless Entry Control Module.

⇓ **If less than 1 V**

Note: When using the MIN MAX function, autorange on the DMM may not function properly. To ensure accurate test results, turn off autorange and manually set the DMM range to 000.0 V.

7. Install a DMM between the signal circuit terminal 1 and the low reference circuit terminal 2. Set the DMM to capture DC voltage using the MIN MAX function.
8. Activate the antenna by pressing the ignition mode switch.
9. Verify the MAX voltage captured by the DMM is greater than 1 V.

⇒ **If 1 V or less**

9.1. Vehicle OFF, disconnect the harness connector at the K84 Keyless Entry Control Module.

9.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K84 Keyless Entry Control Module.

⇓ **If greater than 1V**

10. Replace the appropriate T10 Keyless Entry Antenna.
11. Activate the antenna by pressing the ignition mode switch.
12. Verify the NO REMOTE DETECTED message is not displayed and the vehicle starts.

⇒ **If the NO REMOTE DETECTED message is displayed and the vehicle does not start**

Replace the K84 Keyless Entry Control Module.

⇓ **If the NO REMOTE DETECTED message is not displayed and the vehicle starts**

13. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Ignition Lock Key Transmitter Antenna Replacement - Floor Console on page 12-73*
- *Ignition Lock Key Transmitter Antenna Replacement - Rear Compartment on page 12-74*
- *Control Module References on page 6-3* for keyless entry control module replacement, programming, and setup

Keyless Entry System Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Circuit/System Description

The keyless entry transmitter is part of the vehicle key. The keyless entry system will unlock the vehicle doors or open/unlock the rear compartment when a corresponding button on the keyless entry transmitter is pressed. This is accomplished by the keyless entry transmitter sending a radio frequency to the remote control door lock receiver, which then sends the signal to the body control module (BCM). The BCM interprets the signal and activates the requested function. A low transmitter battery or radio frequency (RF) interference from aftermarket devices such as 2-way radios, power inverters, cellular phone chargers, computers, etc. may cause a system malfunction. High RF traffic areas, such as gas stations which use pay-at-the-pump RF transponders, may also cause interference that could lead to a malfunction.

Diagnostic Aids

- Unwanted or inadvertent door lock/unlock activation may be requested by the OnStar® Remote Link app. It is possible that a customer may be unaware of account usage, result in an unwanted or phantom door lock/unlock. If normal system diagnosis does results in an inability to verify the customer's concern, contact Technical Assistance Center (TAC).
- If available, the EL 43241 Keyless Entry Tester may be used to diagnose a low transmitter battery or a malfunctioning transmitter. To test, place the transmitter on the test pad of the EL 43241 and press each transmitter button one at a time, holding each button for three seconds. If the green light on the tester does not illuminate and a tone does not sound, first replace the transmitter battery and retest. If the malfunction continues after replacing the transmitter battery, replace the transmitter.
- When using the EL 43241 Keyless Entry Tester, first inspect the keyless entry transmitter part number to determine that it is the correct model for the vehicle. An incorrect part number transmitter may pass the test, but it will not activate the keyless entry system.
- When the vehicle key is in the ignition, the keyless entry functions are disabled from all keyless entry transmitters.

Reference Information

Schematic Reference

Remote Function Schematics on page 12-55

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Keyless Entry System Description and Operation on page 12-79

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL 43241 Keyless Entry Tester

Circuit/System Verification

1. Verify that the vehicle key is correct for the vehicle. This can be accomplished by comparing the part number printed on the key to the appropriate part number in the parts catalog.

⇒ **If the vehicle key is incorrect**

Replace the vehicle key.

⇓ **If the vehicle key is correct**

2. Operate the transmitter while observing the scan tool Key Fob Function parameter for the appropriate transmitter.
3. Verify the scan tool Key Fob Function parameter corresponds with the function selected on the transmitter.

⇒ **If the Key Fob Function parameter does not correspond with the transmitter selection**

Note: Before replacing the transmitter, inspect the transmitter battery contacts for any corrosion or damage. If no corrosion or damage is found, replace the transmitter battery and retest before replacing the transmitter.

3.1. Replace the vehicle key.

3.2. Operate the new transmitter while observing the scan tool Key Fob Function parameter for the transmitter.

3.3. Verify the scan tool Key Fob Function parameter correspond with the function selected on the transmitter.

⇒ **If the Key Fob Function parameter does not correspond with the transmitter selection**

Perform Circuit/System Testing.

⇓ **If the Key Fob Function parameter corresponds with the transmitter selection**

4. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, scan tool disconnected, disconnect the harness connector at the K77 Remote Control Door Lock Receiver. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 30 Ω between the low reference circuit terminal 1 and ground.

⇒ **If 30 Ω or greater**

2.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.

2.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If less than 30 Ω**

3. Ignition ON.
4. Test for greater than 11.5 V between the B+ circuit terminal 4 and ground.

⇒ **If 11.5 V or less**

4.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.

4.2. Test for infinite resistance between the B+ circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If Infinite resistance.

4.3. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇓ **If greater than 11.5 V**

5. Test for 1–6 V between the serial data circuit terminal 2 and ground.

⇒ **If less than 1 V**

5.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.

5.2. Test for infinite resistance between the serial data circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

5.3. Test for less than 2 Ω in the serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If greater than 6 V**

5.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module, ignition ON.

5.2. Test for less than 1 V between the serial data circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If between 3–6 V**

6. Ignition OFF, disconnect the X1 and X2 harness connectors at the K9 Body Control Module, ignition ON.
7. Test for less than 1 V between the K9 Body Control Module serial data circuit terminal 26 X1 and ground.

⇒ **If 1 V or greater**

Repair the short to voltage on the circuit.

⇓ **If less than 1 V**

8. Ignition OFF.

9. Test for infinite resistance between the K9 Body Control Module serial data circuit terminal 26 X1 and ground.

⇒ **If less than infinite resistance**

Repair the short to ground on the circuit.

⇓ **If infinite resistance**

10. Test for less than 2 Ω between the K9 Body Control Module serial data circuit terminal 26 X1 and the K77 Remote Control Door Lock Receiver serial data circuit terminal 3.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

⇓ **If less than 2 Ω**

11. Replace the K77 Remote Control Door Lock Receiver.
12. Verify the keyless entry functions operate.

⇒ **If the keyless entry functions do not operate**

Replace the K9 Body Control Module

⇓ **If the keyless entry functions operate**

13. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Key with Integrated Transmitter Programming on page 12-28*
- *Control Module References on page 6-3* for body control module replacement, programming, and setup

Remote Vehicle Start Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of each diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Circuit/System Description

Remote start begins as a radio frequency message sent from a keyless entry transmitter to the remote control door lock receiver. The message is then transferred to the body control module (BCM). The BCM monitors system conditions such as content theft deterrent, hood ajar status, and body DTCs to determine if a remote start event will occur. If conditions are determined to be acceptable, the BCM will activate the appropriate vehicle systems.

Diagnostic Aids

- The scan tool Body Control Module Remote Vehicle Start Disable History 1 Data and Remote Vehicle Start Disable History 2 Data lists can be used to help isolate an intermittent malfunction with remote vehicle starting. These data lists identify the status of various items that may disable remote vehicle starting during the past two remote vehicle start attempts. Any parameters that does not equal the expected result required for remote vehicle starting should be diagnosed in their respective subsection.
- Only the first and second vehicle transmitters are able to control the remote vehicle start function.
- Unwanted or inadvertent door lock/unlock activation may be requested by the OnStar® Remote Link application. It is possible that a customer may be unaware of account usage, resulting in an unwanted or phantom door lock/unlock. If normal system diagnosis results in an inability to verify the customer's concern, contact Technical Assistance Center (TAC).
- If the vehicle has a current vehicle DTC that illuminates the malfunction indicator lamp, the cause of the DTC must be diagnosed before proceeding with the remote start malfunction diagnostic.

Reference Information

Schematic Reference

Remote Function Schematics on page 12-55

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Keyless Entry System Description and Operation on page 12-79

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify the scan tool Body Control Module Push Button Ignition Switch parameter changes between Active and Inactive when pressing and releasing the S38 Vehicle On/Off Switch.

⇒ **If the parameter does not change**

Refer to *Vehicle Will Not Change Power Mode on page 11-867*.

⇓ **If the parameter changes**

2. Verify that remote vehicle start is enabled through vehicle personalization.

⇒ **If remote vehicle start is not enabled through vehicle personalization**

Use vehicle personalization to turn on remote vehicle start functionality. Refer to the vehicle owners manual.

⇓ **If remote vehicle start is enabled**

3. Verify that the keyless entry functions operate with all available keyless entry transmitters.

⇒ **If the keyless entry functions do not operate properly**

Refer to *Keyless Entry System Malfunction on page 12-69*.

⇓ **If the keyless entry functions operate properly**

4. Verify none of the following conditions exist on the vehicle:
   - A current vehicle DTC that illuminates the malfunction indicator lamp (MIL)
   - The vehicle is in valet mode
   - More than two remote starts have been attempted
   - The hazard switch is in the ON position
   - A current hazard switch DTC is set
   - The vehicle hood is ajar
   - A current hood ajar DTC is set
   - The content theft deterrent system detects an alarm trigger
   - Accelerator pedal position greater than 0 percent
   - Vehicle not in park
   - Immobilizer malfunction
   - A current automatic transmission shift lock control system DTC is set
   - A vehicle speed sensor signal is detected by the ECM
   - The vehicle power moding is being controlled by a backup device

⇒ **If any of the conditions are present**

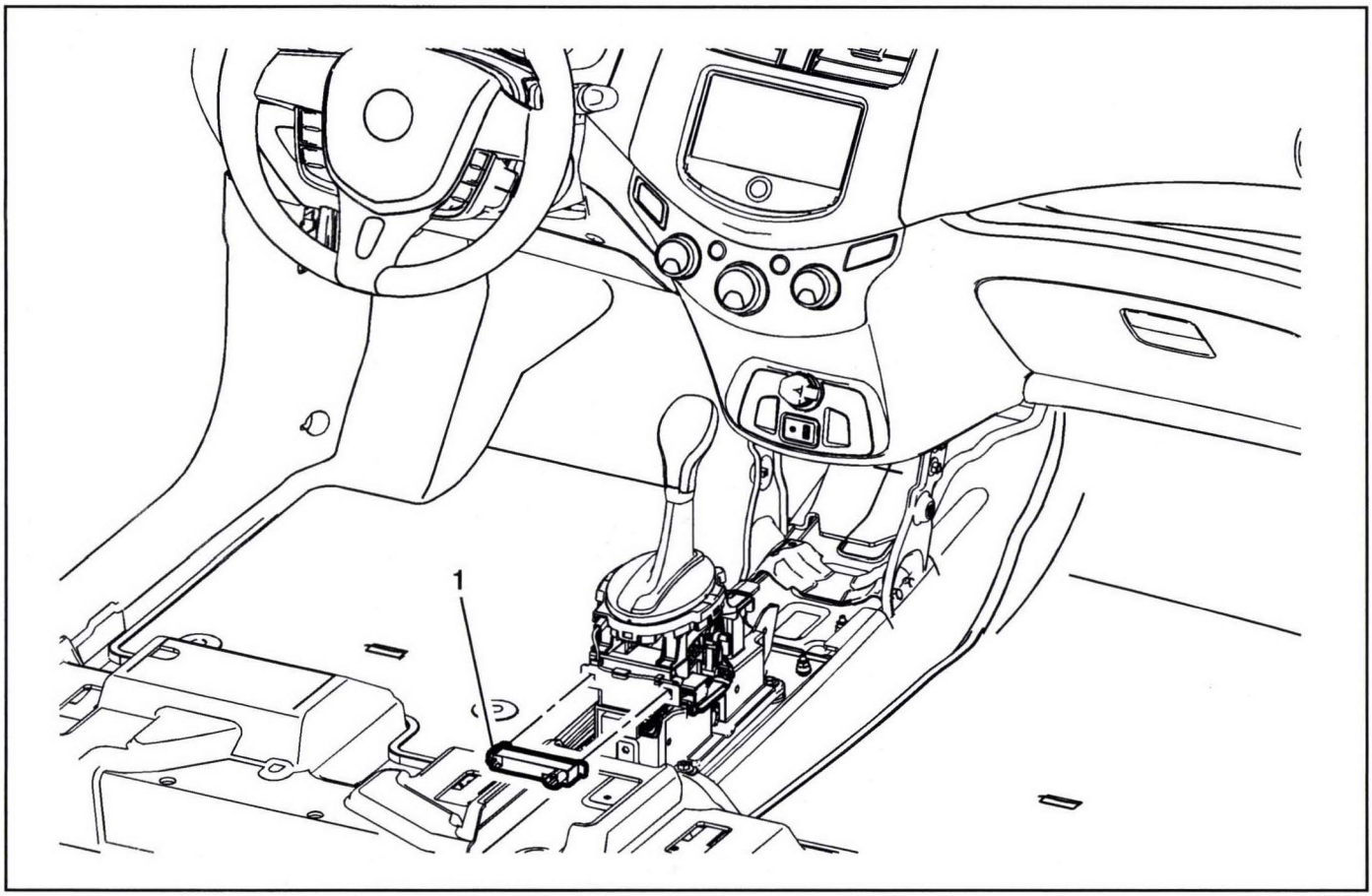
Refer to the appropriate subsection in which the failure occurred.

⇓ **If none of the conditions are present**

5. All OK.

Repair Instructions

Ignition Lock Key Transmitter Antenna Replacement - Floor Console

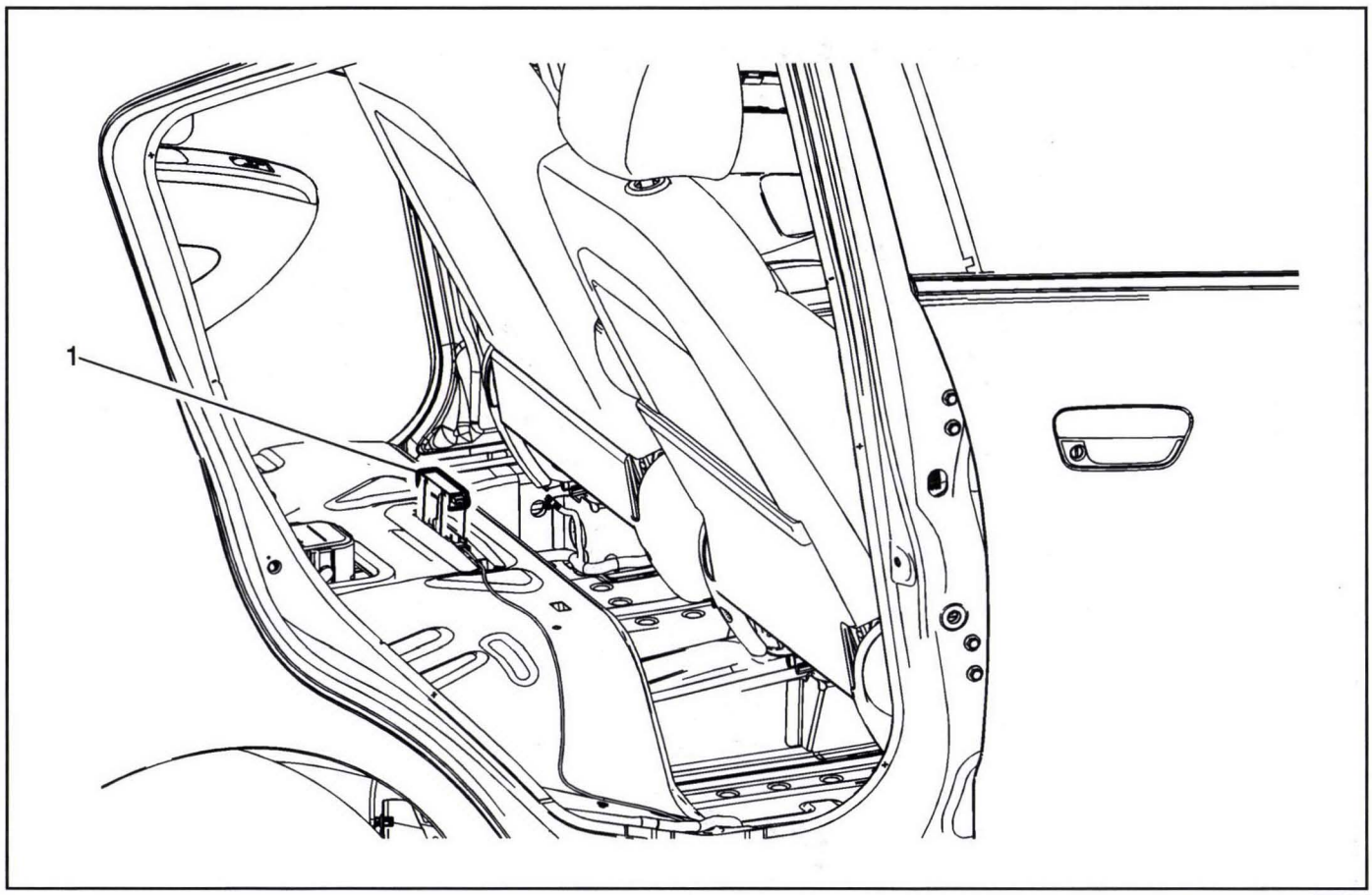


3212644

Ignition Lock Key Transmitter Antenna Replacement - Floor Console

Callout	Component Name
Preliminary Procedure Remove the front floor console. Refer to *Front Floor Console Replacement on page 2-48*.	
1	Ignition Lock Key Transmitter Antenna **Procedure** 1. Disconnect the electrical connector. 2. Unsnap antenna from the bracket.

Ignition Lock Key Transmitter Antenna Replacement - Rear Compartment

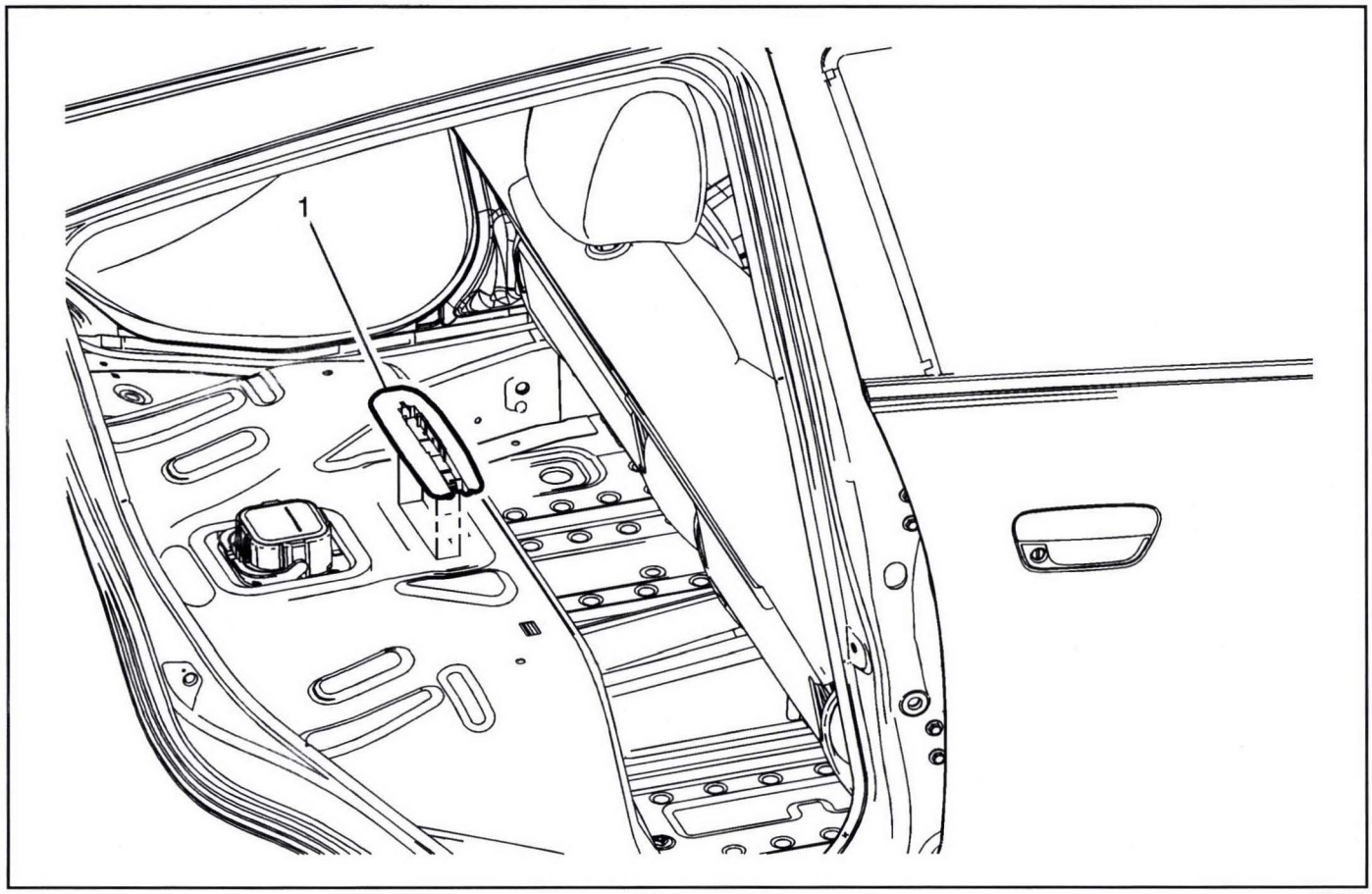


3212646

Ignition Lock Key Transmitter Antenna Replacement - Rear Compartment

Callout	Component Name
Preliminary Procedure Remove the floor panel carpet. Refer to *Floor Panel Carpet Replacement on page 2-19*.	
1	Ignition Lock Key Transmitter Antenna **Procedures** 1. Disconnect the electrical connector. 2. Depress the tabs and remove the ignition lock key transmitter antenna from the bracket.

Ignition Lock Key Transmitter Antenna Bracket Replacement

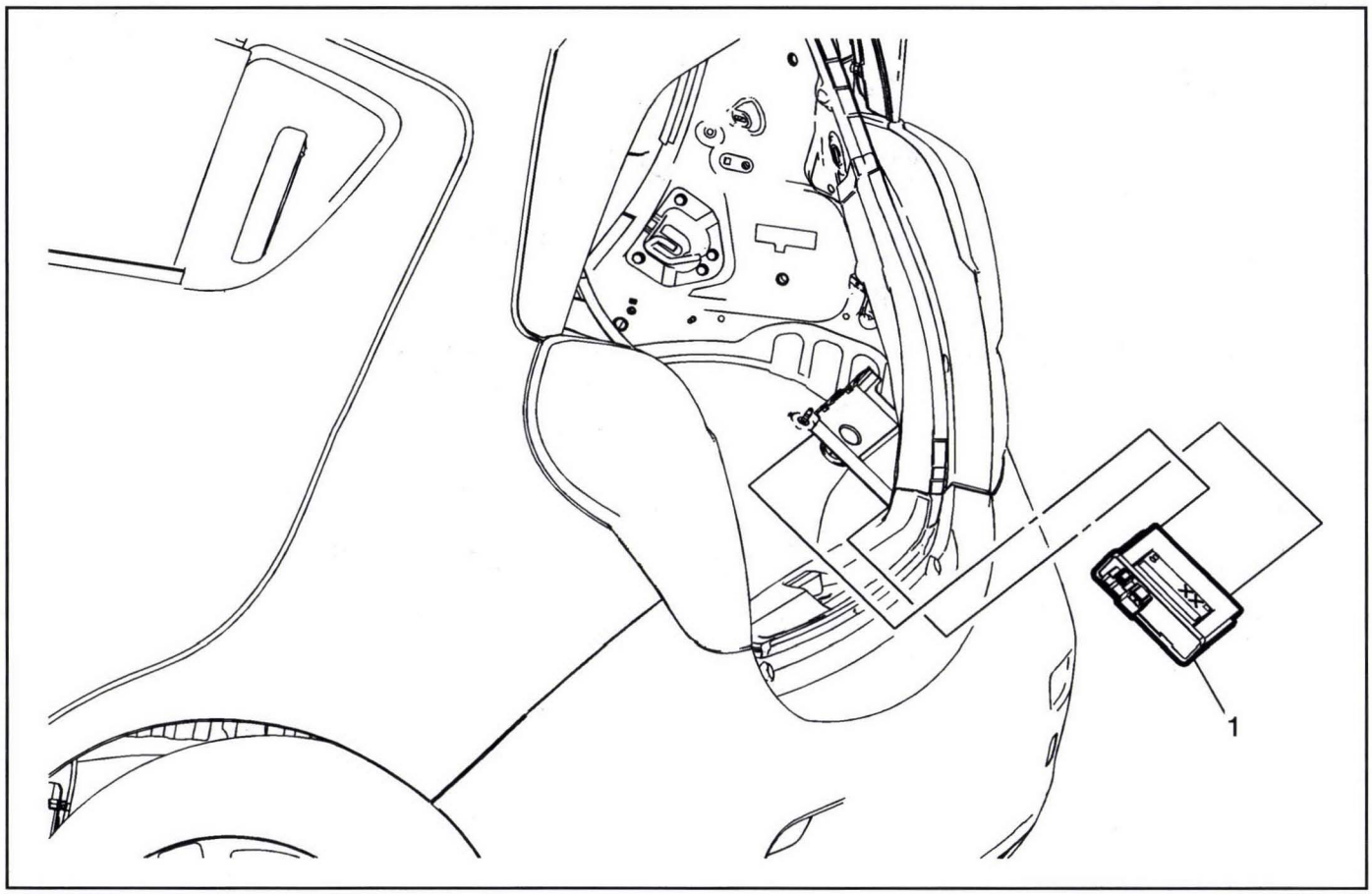


3212647

Ignition Lock Key Transmitter Antenna Bracket Replacement

Callout	Component Name
Preliminary Procedure Remove the ignition lock key transmitter antenna − rear compartment. Refer to *Ignition Lock Key Transmitter Antenna Replacement - Rear Compartment on page 12-74*.	
1	Ignition Lock Key Transmitter Antenna Bracket **Procedure** Gently remove bracket secured with adhesive tape.

Keyless Entry Control Module Replacement

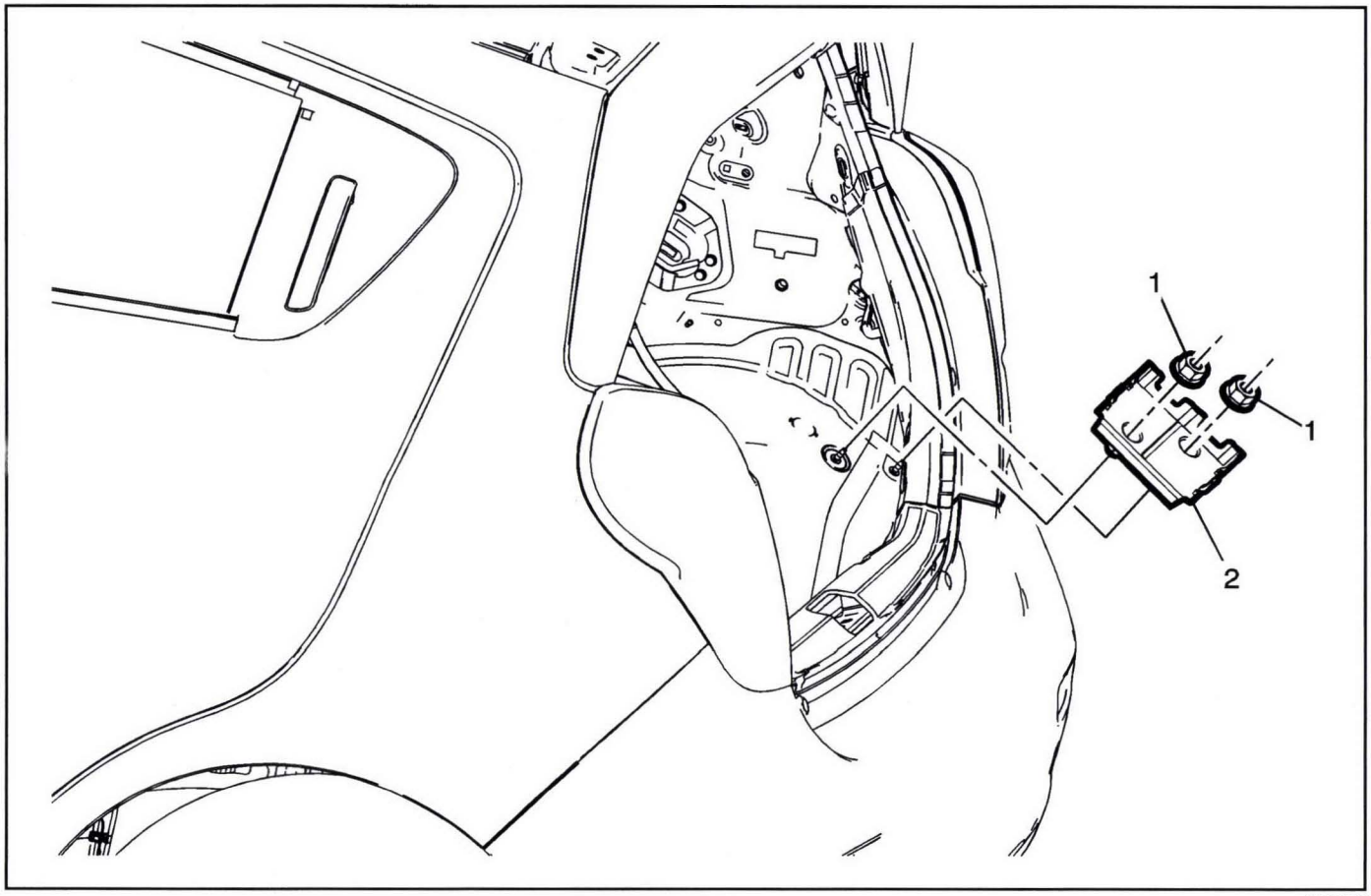


3213927

Keyless Entry Control Module Replacement

Callout	Component Name
Preliminary Procedure Remove the quarter lower rear trim panel. Refer to *Quarter Lower Rear Trim Panel Replacement on page 2-65*.	
1	Keyless Entry Control Module **Procedure** 1. Disconnect the electrical connections. 2. Slide module from bracket. 3. Refer to *Control Module References on page 6-3* for programming and setup information.

Keyless Entry Control Module Bracket Replacement

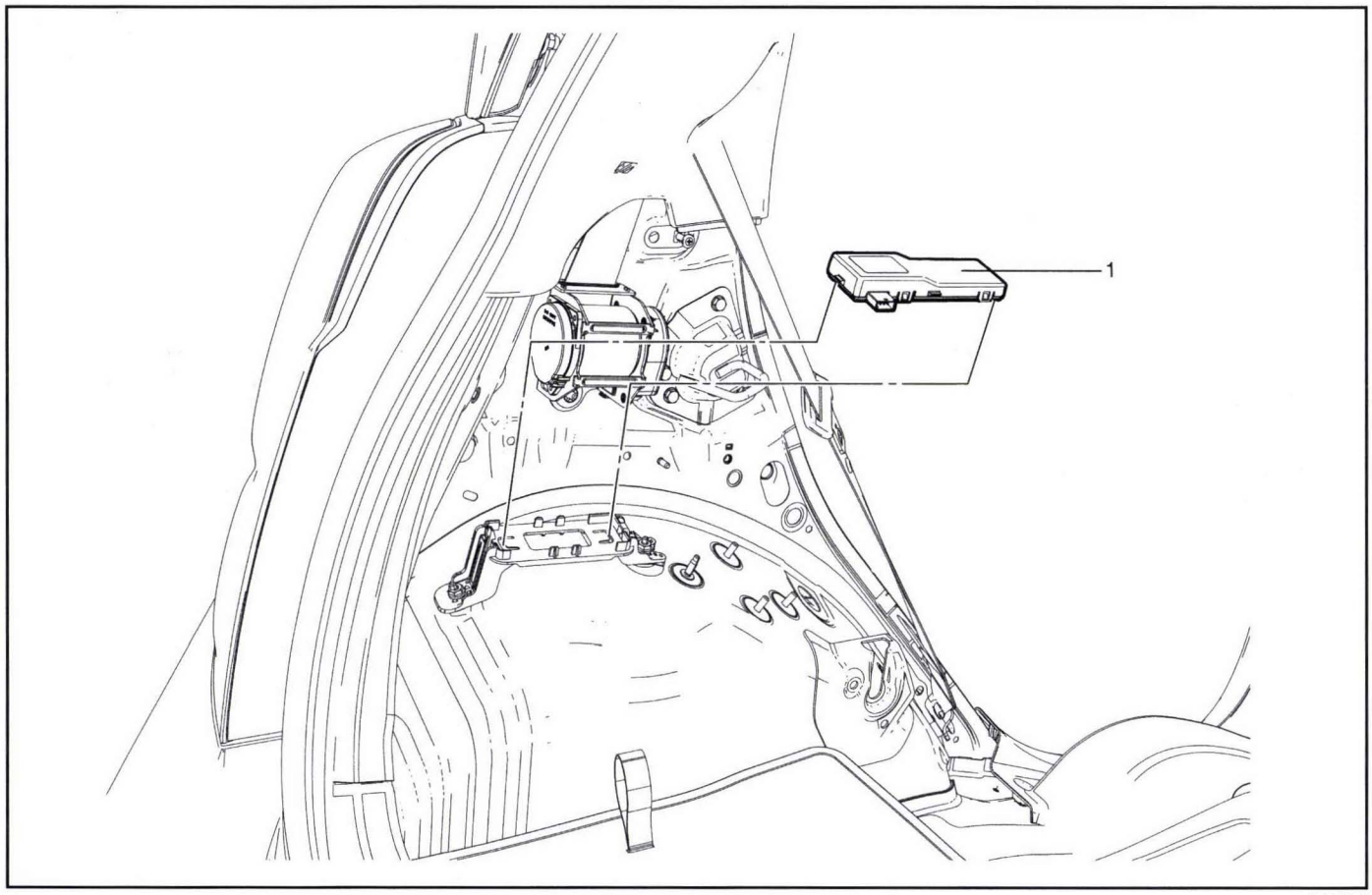


3213929

Keyless Entry Control Module Bracket Replacement

Callout	Component Name
Preliminary Procedure Remove the keyless entry control module. Refer to *Keyless Entry Control Module Replacement on page 12-76*.	
1	Keyless Entry Control Module Bracket Fasteners (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 9 N•m (80 lb in)
2	Keyless Entry Control Module Bracket **Procedure** Transfer components, as necessary.

Remote Control Door Lock Receiver Replacement



3414211

Remote Control Door Lock Receiver Replacement

Callout	Component Name
Preliminary Procedures Remove the left quarter lower rear trim panel. Refer to *Quarter Lower Rear Trim Panel Replacement on page 2-65*.	
1	Remote Control Door Lock Receiver **Procedure** 1. Disconnect the electrical connector. 2. Unclip the remote control door lock receiver and bracket assembly. 3. Remove the remote control door lock receiver from the bracket.

Description and Operation

Keyless Entry System Description and Operation

The keyless entry system is a vehicle entry device. The keyless entry system is used in conjunction with the door locks to unlock the vehicle. Keyless entry will lock/unlock the vehicle doors or open the rear compartment lid when a corresponding button on the keyless entry transmitter is pressed. This is accomplished by the transmitter sending a radio frequency to the remote control door lock receiver antenna that has a direct link to the body control module (BCM). The BCM interprets the signal and activates the requested function or request the appropriate control module to activate the function via a serial data message. A low transmitter battery or radio frequency interference from aftermarket devices, such as 2-way radios, power inverters, computers, etc., may cause a system malfunction. High radio frequency traffic areas, such as gas stations that use pay-at-the-pump radio frequency transponders, may also cause interference that could lead to a malfunction. Keyless entry allows you to operate the following features:

- Door lock/unlock
- Liftgate lock/unlock, if equipped
- Trunk release, if equipped
- Power liftgate, if equipped
- Panic alarm/vehicle locator
- Remote vehicle starting, if equipped

The keyless entry system has the following components:

- Keyless entry transmitters
- Body control module
- Remote control door lock receiver

Keyless Entry Transmitters

Note: When the vehicle key is in the ignition, keyless entry functions from all keyless entry transmitter are disabled.

The keyless entry transmitters are used to perform various entry functions while away from the immediate are of the vehicle. Keyless entry functions may work at up to 20 m (65 ft) away from the vehicle. Ambient conditions may affect the performance of the keyless entry transmitter and reduce the range at which keyless entry functions operate. Up to eight transmitters may be programmed to a single vehicle. The keyless entry transmitter is an integral part of the vehicle key.

OnStar® Remote Link (if equipped)

A vehicle operator may have the ability to perform some of the keyless entry functions using applications on personal devices such as a smart phone. Unwanted or inadvertent door lock/unlock activation may be requested by the OnStar® Remote Link application. It is possible that a customer may be unaware of account usage, resulting in an unwanted or phantom door lock/unlock. If normal system diagnosis results in an inability to verify the customer's concern, contact Technical Assistance Center (TAC).

Body Control Module (BCM)

The BCM is a multifunction module that operates the keyless entry system. When a radio frequency message is received from a keyless entry transmitter, the BCM interprets this signal and performs the specific function, i.e. door lock, door unlock, or vehicle locate.

Remote Control Door Lock Receiver

The remote control door lock receiver acts as an antenna for the keyless entry system and communicates with the BCM through a dedicated serial data link. When a button is pressed on a keyless entry transmitter, the remote control door lock receiver receives this signal and sends the request to the BCM. The BCM interprets the signal and performs the specific function, i.e. door lock, door unlock, or vehicle locate.

Unlock Doors

Momentarily press the transmitter UNLOCK button in order to perform the following functions:

- Unlock only the driver door or all doors and liftgate (if equipped); this is customized through the driver information center.
- Illuminate the interior lamps for a determined length of time or until the ignition is turned ON.
- Flash the exterior lights; this is customized through the driver information center.
- Disarm the content theft deterrent system, if equipped.
- Deactivate the content theft deterrent system when in the alarm mode.

Lock All Doors

Press the transmitter LOCK button to perform the following functions:

- Lock all vehicle doors.
- Immediately turn OFF the interior lamps.
- Flash the exterior lights and/or sound the horn; this is customized through the driver information center.
- Arm the content theft deterrent system.

Trunk Release, if equipped

Press the trunk release button on the transmitter to open the trunk.

Power Liftgate, if equipped

Press and hold the power liftgate button to perform the following functions:

- Open or close the liftgate using the power liftgate function.
- Flash the tail lamps.
- Sound the interior power liftgate chime.

Vehicle Locator/Panic Alarm

A single press of the panic button performs the following functions. Some functions may be dependent on personalization settings:

- Pulse the horn three times.
- Flash the exterior lamps three times.

A press and hold of the panic button performs the following functions:

- Illuminate the interior lamps.
- Pulse the horn and flash the exterior lamps for 30 seconds or until the following conditions occur:
  - The panic button is pressed.
  - The ignition switch is turned to the RUN position with a valid key.

Remote Vehicle Start, if equipped

The remote vehicle start function allows engine starting while not in the vehicle. It also allows the vehicle HVAC system and other vehicle systems to enable, providing a comfortable vehicle upon entry. The remote vehicle start sequence begins by pressing and releasing the lock button and then pressing and holding the remote vehicle start buttons on the keyless entry transmitter. The turn signal lamps will illuminate to indicate the vehicle has received the remote start request. Each time a remote vehicle start is performed, the vehicle doors are locked, however they may then be unlocked/ locked with the transmitter at any time. Only the first and second vehicle transmitters are able to control the remote vehicle start function. Any additional remote transmitters programmed to the vehicle will perform all other remote functions. Once activated, the engine is allowed to run for 10 minutes. The remote vehicle start time may be extended by an additional 10 minutes by again pressing and releasing the lock button and then pressing and holding the remote vehicle start buttons on the transmitter. This feature is called a remote vehicle start continue and allows a maximum of 20 minutes of engine running. If the remote vehicle start continue is performed at 7 minutes into the initial 10 minute time-out, a total of 17 minutes of engine running would occur. The remote vehicle start event may be suspended at any time by pressing only the remote vehicle start button on the transmitter or by entering the vehicle and turning ON the hazard lamps.

In between ignition cycles, only two remote vehicle start events may occur or be attempted. Once two events or attempts have been made, future remote vehicle start events will be suspended until the vehicle is started using the ignition.

Enable/Disable Remote Vehicle Start

Using the driver information center, remote vehicle start may be enabled or disabled as a part of vehicle personalization. Refer to the vehicle owners manual for more information.

Hood Ajar Switch

The hood switch provides status of the hood to the BCM for remote vehicle start purposes. The switch is integrated into the hood latch assembly.

Remote Vehicle Start Circuit Description

The BCM receives a signal from the keyless entry transmitter indicating a remote vehicle start request. A message is then sent to the BCM which determines if a crank request message will be sent to the ECM to allow engine starting. To determine if conditions are correct for a remote vehicle start event, the BCM will ensure the following conditions are met:

- A valid hood ajar switch closed signal is present.
- The doors are locked.
- The low fuel warning light is off.
- The hazard switch is OFF.
- The vehicle power mode is correct.
- No content theft deterrent alarm triggers are present.

When the BCM determines all conditions meet those required for a remote vehicle start event, a message is sent via serial data to the ECM. The ECM relies on the remote vehicle start message from the BCM to enable remote vehicle start when the crank request signal is received. If the ECM does not receive a valid remote vehicle start message, it will not attempt to start the engine. While the ECM is in remote vehicle start mode it will suspend engine operation if any of the following additional conditions occur:

- Vehicle speed is greater than 0
- Transmission is not in PARK
- Excessive engine coolant temperature
- Low oil pressure
- The malfunction indicator lamp (MIL) is commanded ON
- Engine crank time is greater than 30 seconds
- Excessive engine speed
- Accelerator pedal position too high
- Remote start timer equals 0
- Immobilizer system indicates tamper

Keyless Entry Personalization

Vehicle lock/unlock functions and remote vehicle start settings may be personalized. For functional descriptions and personalization instructions, refer to the vehicle owners manual.

Seat Belts

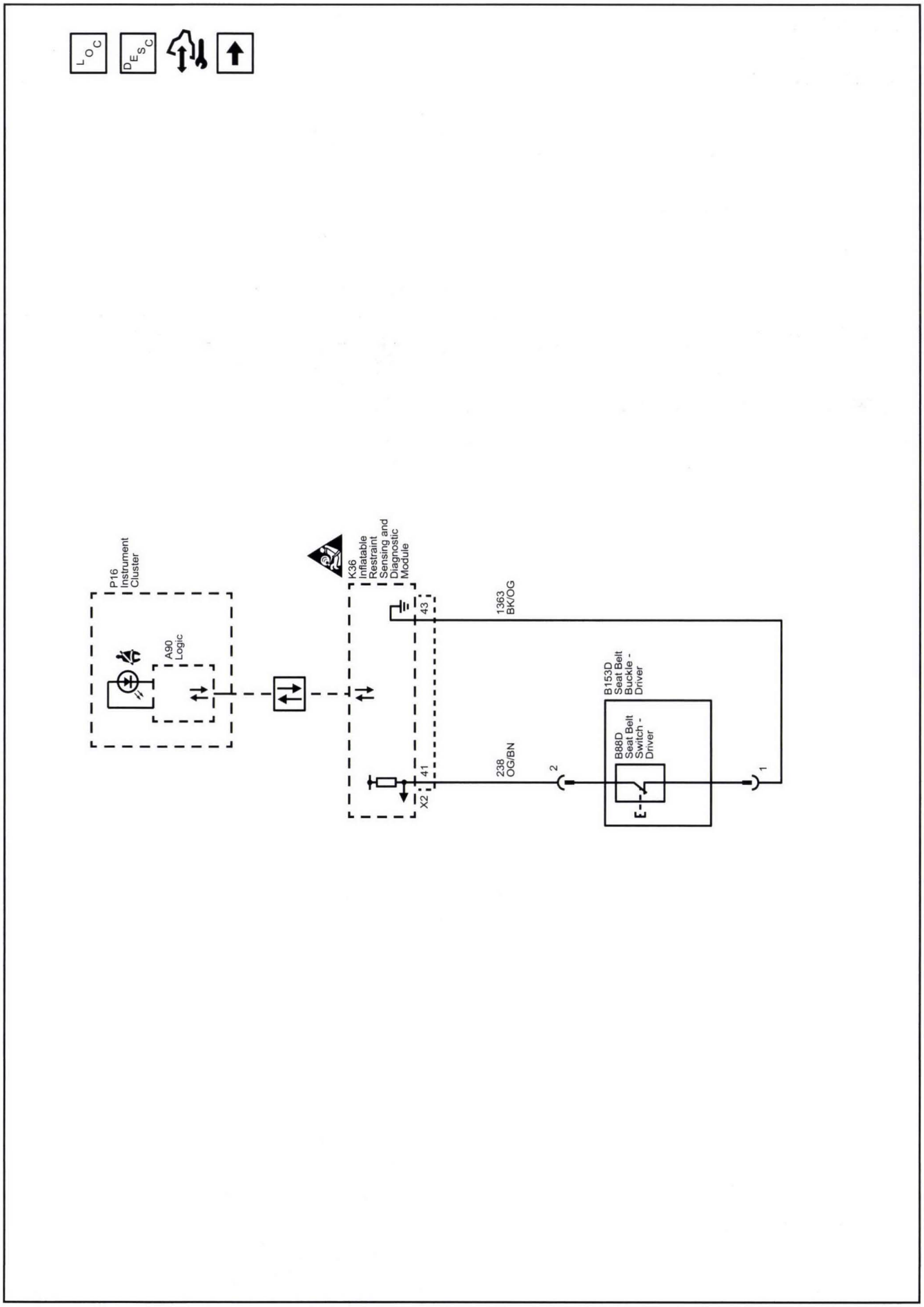
Specifications

Fastener Tightening Specifications

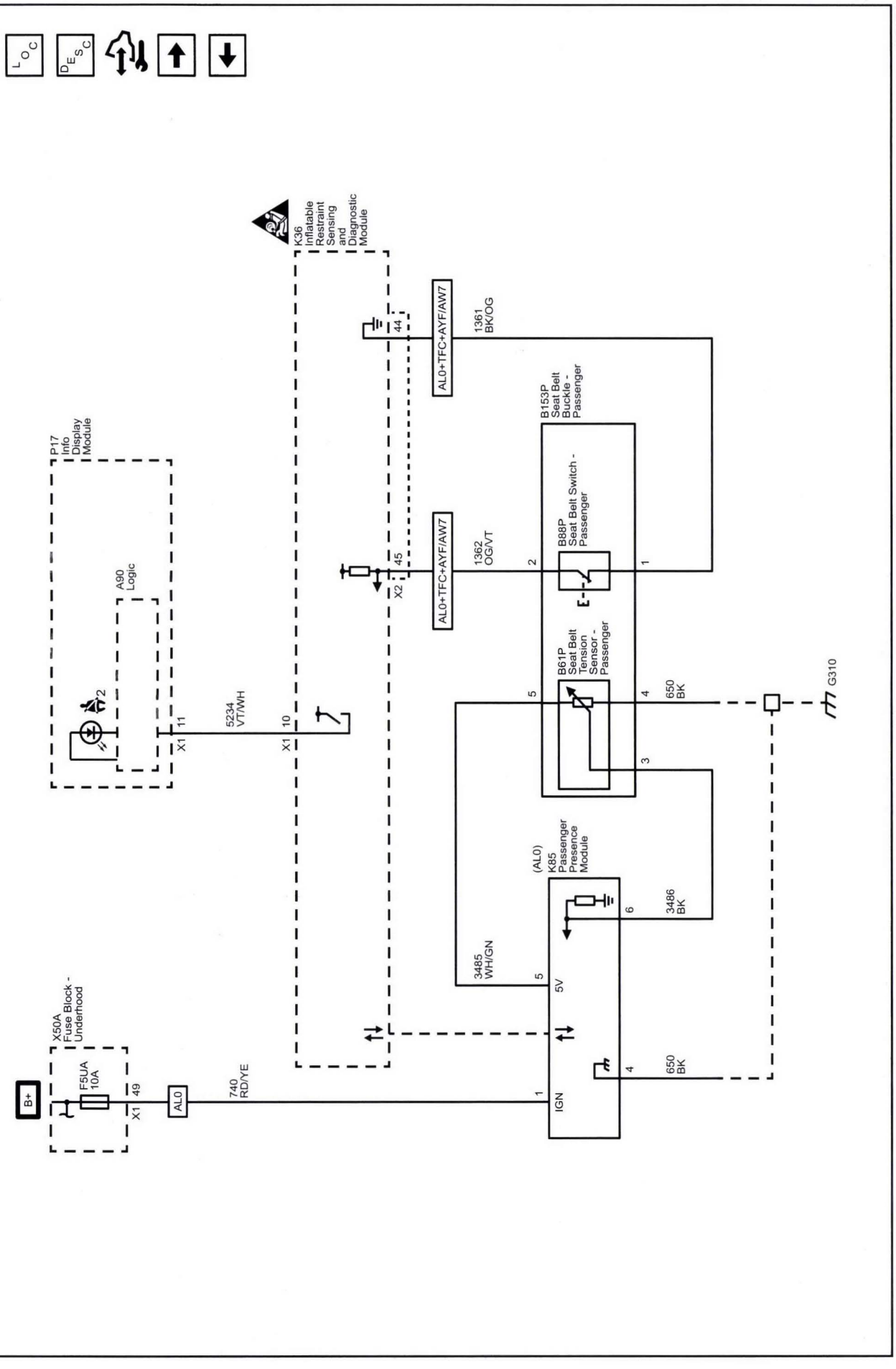
Application	Specification	
	Metric	English
Front Seat Belt Buckle Bolt	40 N•m	30 lb ft
Front Seat Belt Guide Adjuster Bolt	40 N•m	30 lb ft
Rear Seat Belt Buckle Bolt	40 N•m	30 lb ft
Rear Seat Belt Anchor Bolt	40 N•m	30 lb ft
Rear Seat Belt Retractor Bolt	40 N•m	30 lb ft

Schematic and Routing Diagrams

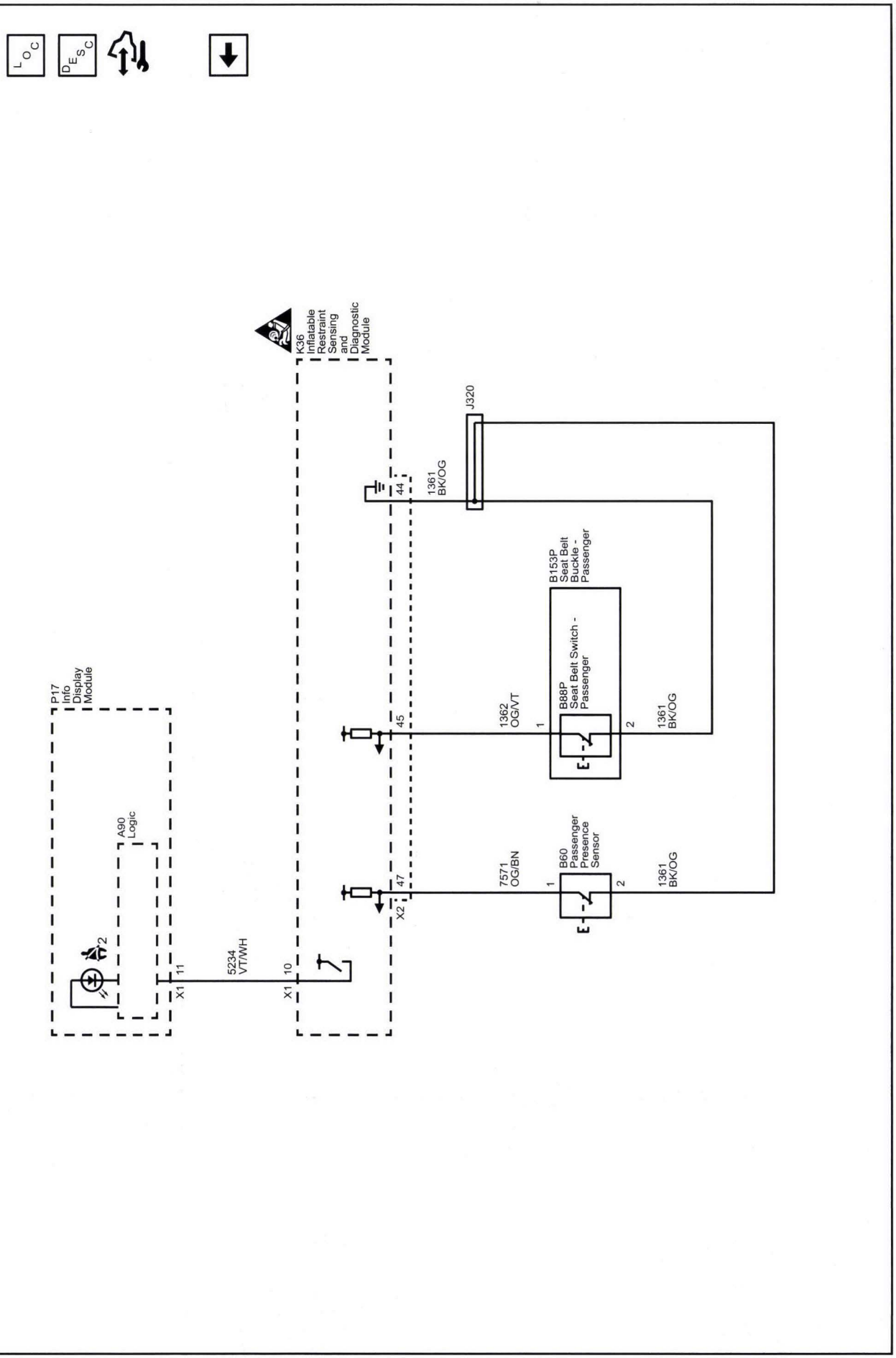
Seat Belt Schematics (Driver Switch and Indicator (AYF/AW7))



Seat Belt Schematics (Passenger Indicators, Sensors, and Switches)



Seat Belt Schematics (Passenger Indicators, Sensors, and Switches (TFC+AW7-AL0))



Diagnostic Information and Procedures

DTC B0082

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0082 01: Seat Belt Reminder Sensor Short to Battery
DTC B0082 02: Seat Belt Reminder Sensor Short to Ground
DTC B0082 04: Seat Belt Reminder Sensor Open Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Seat Belt Reminder Sensor Signal	B0082 02	B0082 04	B0082 01	—
Seat Belt Reminder Sensor Low Reference	—	B0082 04	—	—

Circuit/System Description

The seat belt reminder sensor is within the passenger seat cushion and provides an input to the Inflatable Restraint Sensing and Diagnostic Module (SDM). The Inflatable Restraint Sensing and Diagnostic Module supplies a low reference circuit and a seat belt reminder sensor signal circuit to determine seated or unseated condition of passenger seat.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

B0082 01

The Inflatable Restraint Sensing and Diagnostic Module detects a short to voltage in the seat belt reminder sensor signal circuit.

B0082 02

The Inflatable Restraint Sensing and Diagnostic Module detects a short to ground in the seat belt reminder sensor signal circuit

B0082 04

The Inflatable Restraint Sensing and Diagnostic Module detects an open/high resistance in the seat belt reminder sensor signal circuit or the seat belt reminder sensor ground circuit

Action Taken When the DTC Sets

The SIR System is disabled and no deployments are allowed.

Conditions for Clearing the DTC

- The DTC will be current for as long as the fault is present
- When the fault is no longer present, the DTC will be a history DTC
- A history DTC will clear after 50 ignition cycles

Reference Information

Schematic Reference

Seat Belt Schematics on page 12-82

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*
- *Connector Repairs on page 11-895*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle ON.
2. Verify, with the passenger seat unoccupied, the scan tool Passenger Seat Occupancy Status parameter is Empty Seat.

⇒ **If not Empty Seat**

Refer to Circuit/System Testing

⇓ **If Empty Seat**

3. Verify, with the passenger seat occupied, the scan tool Passenger Seat Occupancy Status parameter is Occupied.

⇒ **If not Occupied**

Refer to Circuit/System Testing

⇓ **If Occupied**

4. All OK.

Circuit/System Testing

1. Vehicle OFF. Disconnect the harness connector at the B60 Passenger Presence Sensor, wait 2 min.
2. Test for less than 30 Ω between the low reference circuit terminal 2 and ground.

⇒ **If 30 Ω or greater**

2.1. Vehicle OFF.

2.2. Disconnect the X2 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

2.3. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 30 Ω**

3. Vehicle ON.
4. Test for 4.75–5.25 V between the signal circuit terminal 1 and ground.

⇒ **If less than 4.75 V**

4.1. Vehicle OFF.

4.2. Disconnect the X2 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

4.3. Test for infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

4.4. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇒ **If greater than 5.25 V**

4.1. Vehicle OFF.

4.2. Disconnect the X2 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module. Ignition ON.

4.3. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If between 4.75–5.25 V**

5. Replace the B60 Passenger Presence Sensor.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Front Seat Cushion Cover and Pad Replacement on page 13-12* for Passenger Presence Sensor replacement
- *Control Module References on page 6-3* for Inflatable Restraint Sensing and Diagnostic Module control module replacement, programming and setup

Symptoms - Seat Belts

Note: Review the seat belt system description and operation in order to familiarize yourself with the system and how it functions. Refer to *Seat Belt System Description and Operation on page 12-98*.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the seat belt system. Refer to *Checking Aftermarket Accessories on page 11-871*.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.

Symptom List

Refer to the following symptom diagnostic procedure in order to diagnose the symptom:

- *Seat Belt Indicator Malfunction - Driver on page 12-87*
- *Seat Belt Indicator Malfunction - Passenger on page 12-89*

Seat Belt Does Not Retract

1. Grab the seat belt webbing and slowly and firmly extract 15–25 mm (5/8–1 in) of webbing from the seat belt.
2. Release the seat belt and allow the webbing to slowly retract back into the retractor.
3. Check to see if the seat belt is released. If the seat belt is not released, repeat steps 1 and 2, two times more.
4. If the retractor does not release after repeating the steps, replace with a new retractor.

Seat Belt Indicator Malfunction - Driver

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Driver Seat Belt Switch Signal	1	2	2	2	—
Driver Seat Belt Switch Low Reference	—	2	2	2	—
1. Indicator will remain ON with seat belt buckled. 2. Indicator will illuminate only for the bulb check.					

Circuit/System Description

The driver seat belt switch is a 2-wire switch wired to the Inflatable Restraint Sensing and Diagnostic Module (SDM) using a signal circuit and a low reference circuit. When the seat belt is unbuckled the switch is closed, and when the seat belt is buckled the switch is open. The SDM sends the status of the driver seat belt via serial data to the instrument panel cluster. After receiving the message, the instrument panel cluster controls the illumination of the driver seat belt indicator.

Reference Information

Schematic Reference

Seat Belt Schematics on page 12-82

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Seat Belt System Description and Operation on page 12-98

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Command the instrument cluster all indicators ON and OFF with a scan tool. The driver seat belt indicator should turn ON and OFF as commanded.

⇒ **If the driver seat belt indicator does not turn ON and OFF as commanded**

Replace the P16 Instrument Cluster.

⇓ **If the driver seat belt indicator does turn ON and OFF as commanded**

2. Monitor the scan tool Driver Seat Belt Switch parameter while buckling and unbuckling the seat belt. The parameter should display Buckled and Unbuckled when changing seat belt states.

⇒ **If the scan tool Driver Seat Belt Switch parameter does not display Buckled and Unbuckled when changing seat belt states**

Refer to Circuit/System Testing.

⇓ **If the scan tool Driver Seat Belt Switch parameter does display Buckled and Unbuckled when changing seat belt states**

3. All OK.

Circuit/System Testing

Note: When removing connectors inspect for damage or corrosion. Damage or corrosion in the following requires repair or replacement of the affected component/connector.

- B153D Seat Belt Buckle – Driver
- Seat belt switch harness connector
- K36 Inflatable Restraint Sensing and Diagnostic Module
- Inflatable Restraint Sensing and Diagnostic Module wiring harness connector

1. Vehicle OFF.
2. Disconnect the harness connector at the B153D Seat Belt Buckle – Driver.
3. Test for less than 5 Ω between the low reference circuit terminal 2 and ground.

⇒ **If 5 Ω or greater**

3.1. Disconnect the harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

3.2. Test for less than 2 Ω in each control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 5 Ω**

4. Vehicle in Service Mode.
5. Verify the scan tool Driver Seat Belt Status parameter displays Buckled.

⇒ **If the scan tool Driver Seat Belt Status parameter does not display Buckled**

5.1. Disconnect the harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

5.2. Test for infinite resistance between the seat belt switch signal circuit terminal 1 and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If the scan tool Driver Seat Belt Status parameter does display Buckled**

6. Install a 3 A fused jumper wire between the signal circuit terminal 1 and the low reference circuit terminal 2.
7. Verify the scan tool Driver Seat Belt Status parameter displays Unbuckled.

⇒ **If the scan tool Driver Seat Belt Status parameter does not display Unbuckled**

7.1. Disconnect the harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

7.2. Vehicle in Service Mode.

7.3. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

7.4. Test for less than 2 Ω in each circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If the scan tool Driver Seat Belt Status parameter does display Unbuckled**

8. Replace the B153D Seat Belt Buckle – Driver.

Component Testing

1. Vehicle OFF.
2. Disconnect the harness connector at the B153D Seat Belt Buckle – Driver, buckle the driver seat belt.
3. Test for infinite resistance between the signal circuit terminal 1 and the ground terminal 2 at the B153D Seat Belt Buckle – Driver.

⇒ **If there is not infinite resistance**

Replace the B153D Seat Belt Buckle – Driver.

⇓ **If there is infinite resistance**

4. Unbuckle the driver seat belt.
5. Test for less than 1 Ω between the signal circuit terminal 1 and the ground terminal 2 at the B153D Seat Belt Buckle – Driver.

⇒ **If 1 Ω or greater**

Replace theB153D Seat Belt Buckle – Driver.

⇓ **If less than 1 Ω**

6. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the diagnostic procedure.

- *Front Seat Belt Buckle Replacement on page 12-94*
- *Control Module References on page 6-3* for Inflatable Restraint Sensing and Diagnostic Module and Instrument Cluster replacement, programming and setup

Seat Belt Indicator Malfunction - Passenger

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Passenger Seat Belt Buckle Signal	1	2	2	—
Passenger Seat Belt Buckle Low Reference	—	2	—	—
Passenger Seat Belt Indicator Control	3	3	4	—

1. Indicator will remain ON with Seat Belt Buckled.
2. Indicator will illuminate only for the bulb check.
3. Indicator will not illuminate.
4. Indicator always ON.

Circuit/System Description

When an individual is sitting in the passenger seat the passenger presence sensor detects the individual. A signal to the Inflatable Restraint Sensing and Diagnostic Module indicates a person is in the passenger seat. The Inflatable Restraint Sensing and Diagnostic Module will turn the passenger seat belt indicator on. The passenger Seat Belt Buckle is a 2-wire switch wired to the Inflatable Restraint Sensing and Diagnostic Module (SDM) using a signal circuit and a low reference circuit. When the seat belt is unbuckled the switch is closed, and when the seat belt is buckled the switch is open. The Inflatable Restraint Sensing and Diagnostic Module controls the passenger seat belt indicator via a hard wire to the Info Display Module.

Diagnostic Aids

Objects on the passenger seat can cause the passenger seat belt reminder to be commanded on. Depending on the sensing technology used, a conductive object (computers, MP3 players, cell phones, diagnostic scan tool, wires, a hand, etc.) placed on the passenger seat may cause the Passenger Presence Detection Module to command the passenger air bag indicator ON and/or command the passenger seat belt indicator ON. The fasten seat belt chime will also sound.

Reference Information

Schematic Reference

Seat Belt Schematics on page 12-82

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Seat Belt System Description and Operation on page 12-98

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify the passenger seat belt indicator turns ON and OFF when performing the Passenger Seat Belt Reminder Indicator On/Off Control Function with a scan tool.

⇒ **If the passenger seat belt indicator does not turn ON and OFF**

Refer to Seat Belt Indicator Malfunction in Circuit/System Testing.

⇓ **If the passenger seat belt indicator turns ON and OFF**

3. Verify the scan tool Passenger Seat Belt Status parameter changes between Buckled and Unbuckled when buckling and unbuckling the seat belt.

⇒ **If the parameter does not change between Buckled and Unbuckled when buckling and unbuckling the seat belt**

Refer to Seat Belt Switch Malfunction in Circuit/ System Testing.

⇓ **If the parameter changes between Buckled and Unbuckled when buckling and unbuckling the seat belt**

4. All OK.

Circuit/System Testing

Seat Belt Buckle Malfunction

Note: When removing connectors inspect for damage or corrosion. Damage or corrosion in the following requires repair or replacement of the affected component/connector.

- B153 Seat Belt Buckle
- Seat Belt Buckle harness connector
- K36 Inflatable Restraint Sensing and Diagnostic Module
- Inflatable Restraint Sensing and Diagnostic Module harness connector

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the B153P Seat Belt Buckle–Passenger. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 5 Ω between the low reference circuit terminal 2 (AL0) or 1 (without AL0) and ground.

⇒ **If 5 Ω or greater**

2.1. Disconnect the harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

2.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 5 Ω**

3. Vehicle in Service Mode.
4. Verify the scan tool Passenger Seat Belt Status parameter is Buckled.

⇒ **If not Buckled**

4.1. Disconnect the harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

4.2. Test for infinite resistance between the Seat Belt Buckle signal circuit terminal 1 (AL0) or 2 (without AL0) and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If Buckled**

5. Install a 3 A fused jumper wire between the signal circuit terminal 1 (AL0) or 2 (without AL0) and the low reference circuit terminal 2 (AL0) or 1 (without AL0).
6. Verify the scan tool Passenger Seat Belt Status parameter is Unbuckled.

⇒ **If not Unbuckled**

6.1. Disconnect the harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module, vehicle in Service Mode.

6.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

6.3. Test for less than 2 Ω in each circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If Unbuckled**

7. Test or replace the B153P Seat Belt Buckle–Passenger.

Seat Belt Indicator Malfunction

1. Vehicle OFF, disconnect the harness connector at the P17 Info Display Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 7 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Connect a test lamp between the control circuit terminal 11 and ground, vehicle in Service Mode.
4. Verify with a scan tool, command the Passenger Seat Belt Reminder Indicator ON and OFF, the test lamp should turn ON and OFF while changing between the commanded states.

⇒ **If the test lamp is always ON**

4.1. Vehicle OFF, disconnect the harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module, vehicle in Service Mode.

4.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1V or greater, repair the short to voltage on the circuit.

⇒ If less than 1V, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇒ **If the test lamp is always OFF**

4.1. Vehicle OFF, disconnect the harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

4.2. Test for infinite resistance between the control circuit terminal 4 and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

4.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If test lamp turns ON and OFF**

5. Replace the P17 Info Display Module.

Component Testing

1. Vehicle OFF, disconnect the harness connector at the B153P Seat Belt Buckle–Passenger, buckle the passenger seat belt.
2. Test for infinite resistance between the signal circuit terminal 1 (AL0) or 2 (without AL0) and the low reference terminal 2 (AL0) or 1 (without AL0).

⇒ **If not infinite resistance**

Replace the B153P Seat Belt Buckle–Passenger.

⇓ **If infinite resistance**

3. Unbuckle the passenger seat belt.
4. Test for less than 1 Ω between the signal circuit terminal 1 (AL0) or 2 (without AL0) and the low reference terminal 2 (AL0) or 1 (without AL0).

⇒ **If 1 Ω or greater**

Replace the B153P Seat Belt Buckle–Passenger.

⇓ **If less than 1 Ω**

5. All OK.

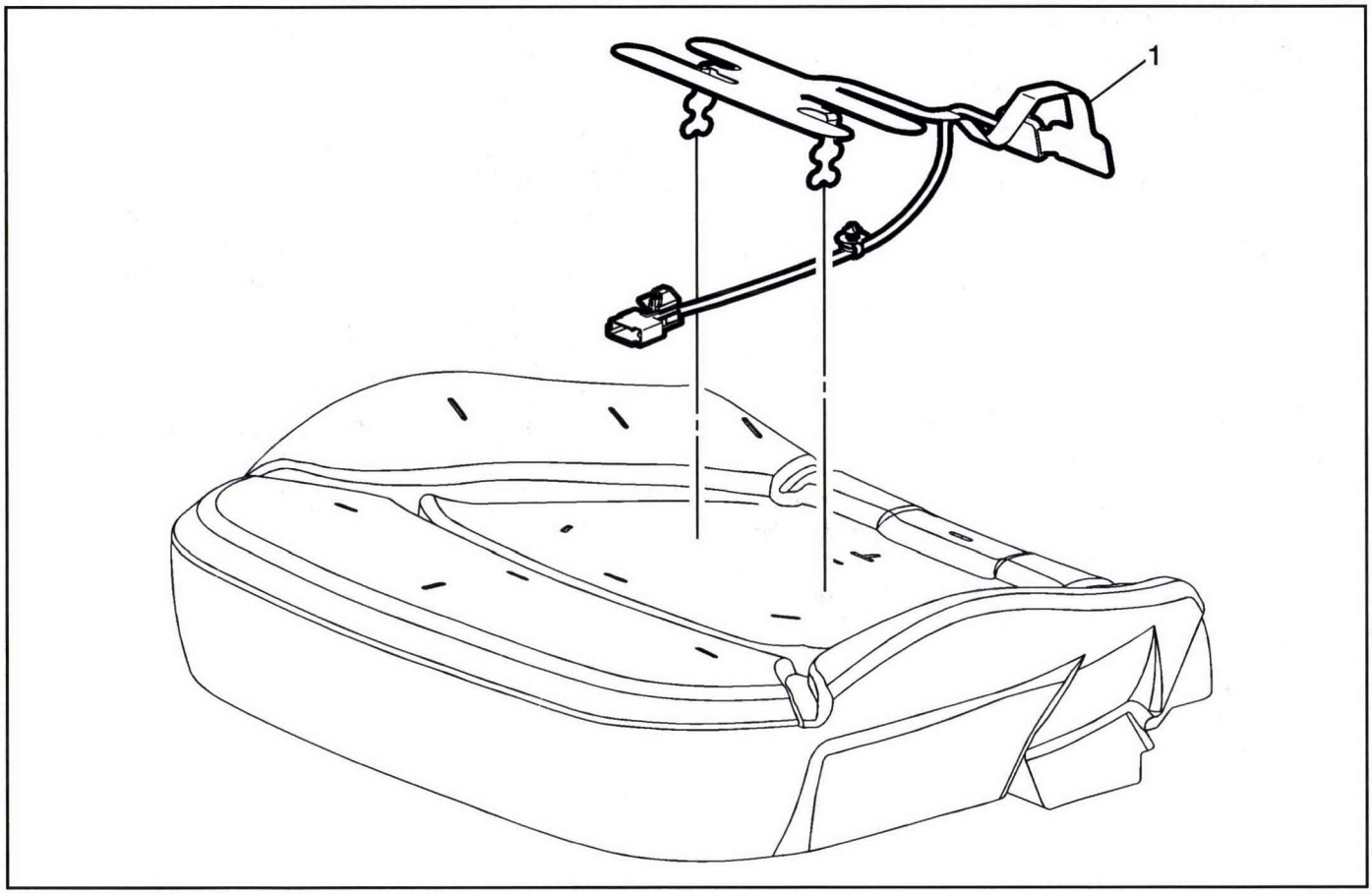
Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair

- *Front Seat Belt Buckle Replacement on page 12-94*
- *Information Center Telltale Assembly Replacement on page 8-94* for P17 Info Display Module replacement
- *Control Module References on page 6-3* for Inflatable Restraint Sensing and Diagnostic Module or Instrument Cluster replacement, programming and setup

Repair Instructions

Passenger Seat Belt Front Passenger Presence Sensor Replacement (Korea)



2969445

Passenger Seat Belt Front Passenger Presence Sensor Replacement (Korea)

Callout	Component Name
Warning: Refer to SIR Warning on page 0-7. ***Warning: To avoid personal injuries, re-zero the passenger presence system whenever you remove or replace the seat cushion or trim. Failure to do so may cause the system to malfunction.*** **Preliminary Procedure** 1. Remove the driver or passenger seat. Refer to *Driver or Passenger Seat Removal and Installation on page 13-3*. 2. Remove the front seat cushion cover. Refer to *Front Seat Cushion Cover and Pad Replacement on page 13-12*.	
1	Passenger Seat Belt Front Passenger Sensor Replacement **Procedures** 1. Disconnect the retainer clip and electrical connector. 2. Remove the hog rings that attach the seat belt sensor to the foam cushion pad. 3. Remove the seat belt sensor from the foam cushion pad and heater assembly, if equipped. 4. When installing the passenger seat belt front passenger sensor. Refer to *Control Module References on page 6-3*. 5. Tuck the seat belt sensor into the cushion pad trench at the proper locations. 6. Transfer components as necessary. 7. Note the routing of the wiring harness and connector location for installation.

Repairs and Inspections Required After a Collision

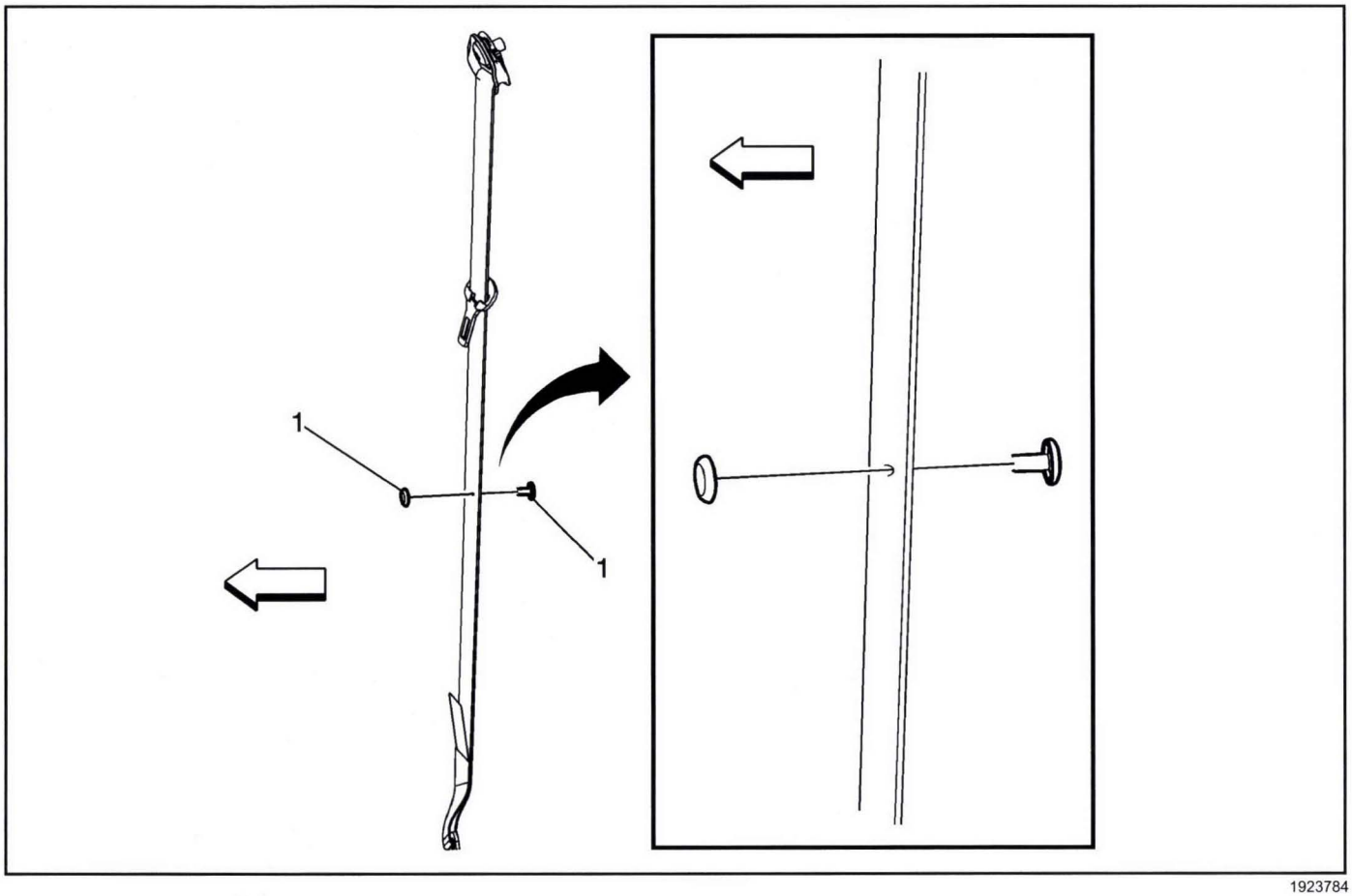
Warning: Restraint systems can be damaged in a collision. To help avoid injury and ensure that all parts in need of replacement are replaced:

- ***Replace any seat belt system that was in use during the collision serious enough to deploy any automatic restraint device such as air bags and seat belt pretensioners. This not only includes seat belt systems in use by people of adult size, but seat belt systems used to secure child restraints, infant carriers and booster seats, including LATCH system and top tether anchorages.***
- ***Replace any seat belt system that has torn, worn, or damaged components. This not only includes adult seat belt systems, but built-in child restraints and LATCH system components, if any.***
- ***Replace any seat belt system if you observe the words "REPLACE" or "CAUTION", or if a yellow tag is visible. Do not replace a seat belt if only the child seat caution label is visible.***
- ***Replace any seat belt system if you are doubtful about its condition. This not only includes adult seat belt systems, but built-in child restraints, LATCH system components, and any restraint system used to secure infant carriers, child restraints, and booster seats.***

  Do NOT replace single seat belt system components in vehicles that have been in a collision as described above. Always replace the entire seat belt system with the buckle, guide and retractor assembly, which includes the latch and webbing material.

After a minor collision where no automatic restraint device was deployed, seat belt system replacement may not be necessary, unless some of the parts are torn, worn, or damaged.

Seat Belt Latch Stop Installation

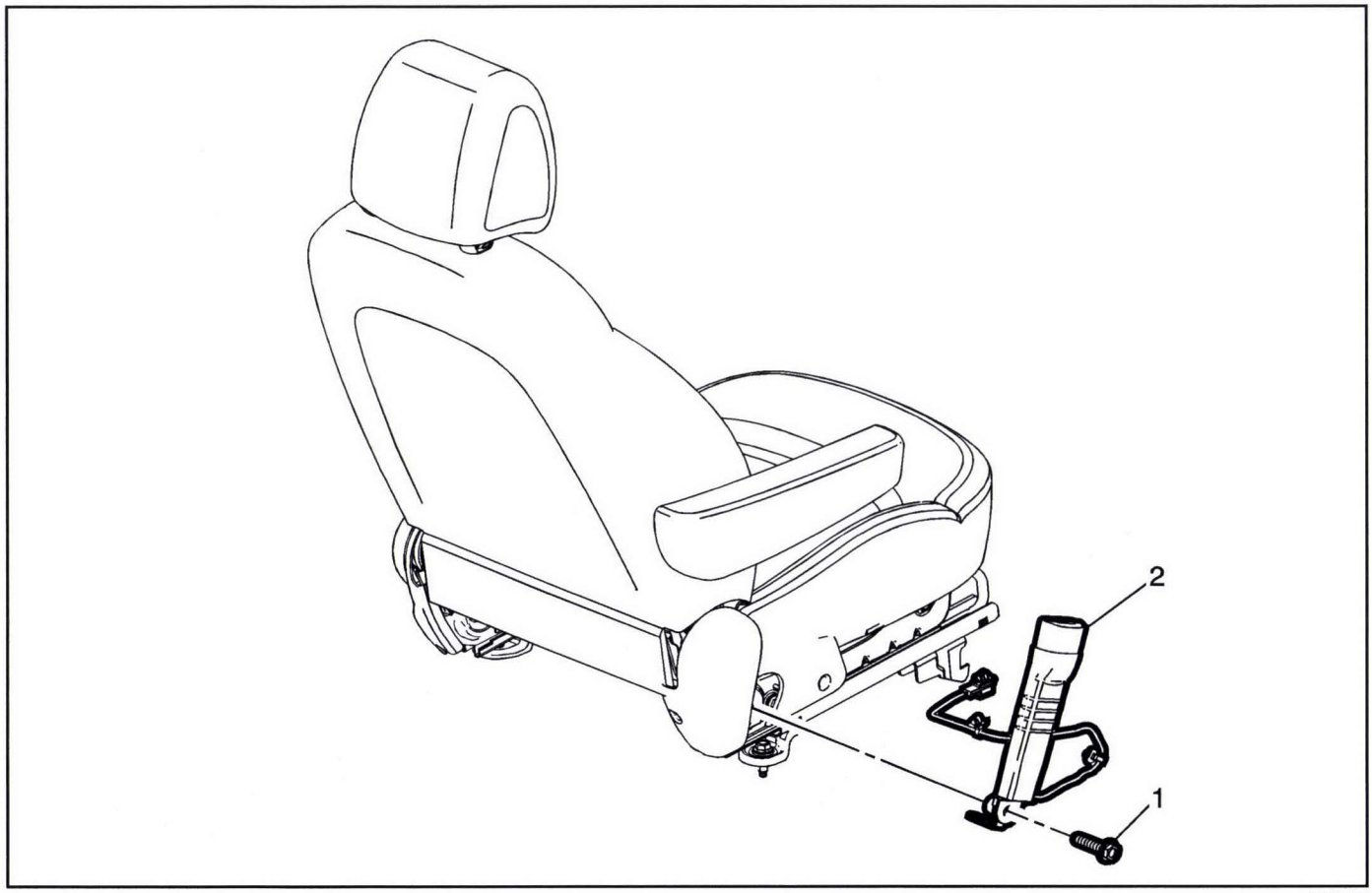


1923784

Seat Belt Latch Stop Installation

Callout	Component Name
Preliminary Procedure 1. Locate the hole in the seat belt webbing where the original seat belt stop button was located. 2. If the original hole in the seat belt webbing is not visible, perform the following: • If either the right or left stop button is missing use the opposing seat belt as a reference. • With the opposing seat belt fully stowed, measure the distance between the seat belt lower anchor and the stop button. • Using the measurement obtained above, measure and mark the location of the missing stop button on the center of the seat belt webbing. 3. Ensure the seat belt latch plate is located above the mark or original hole.	
1	Seat Belt Stop Button **Procedure** 1. Work the male half of the stop button through the hole in the webbing or at the marked location. 2. Align the female half of the stop button with the male half of the stop button. 3. Snap the two halves together. 4. Trim off any access of the male half of the stop button flush with the female half of the stop button. **Tip:** Ensure the male half of the stop button is facing forward in the vehicle in order to ensure the stop button will not snag customers clothing.

Front Seat Belt Buckle Replacement



2969400

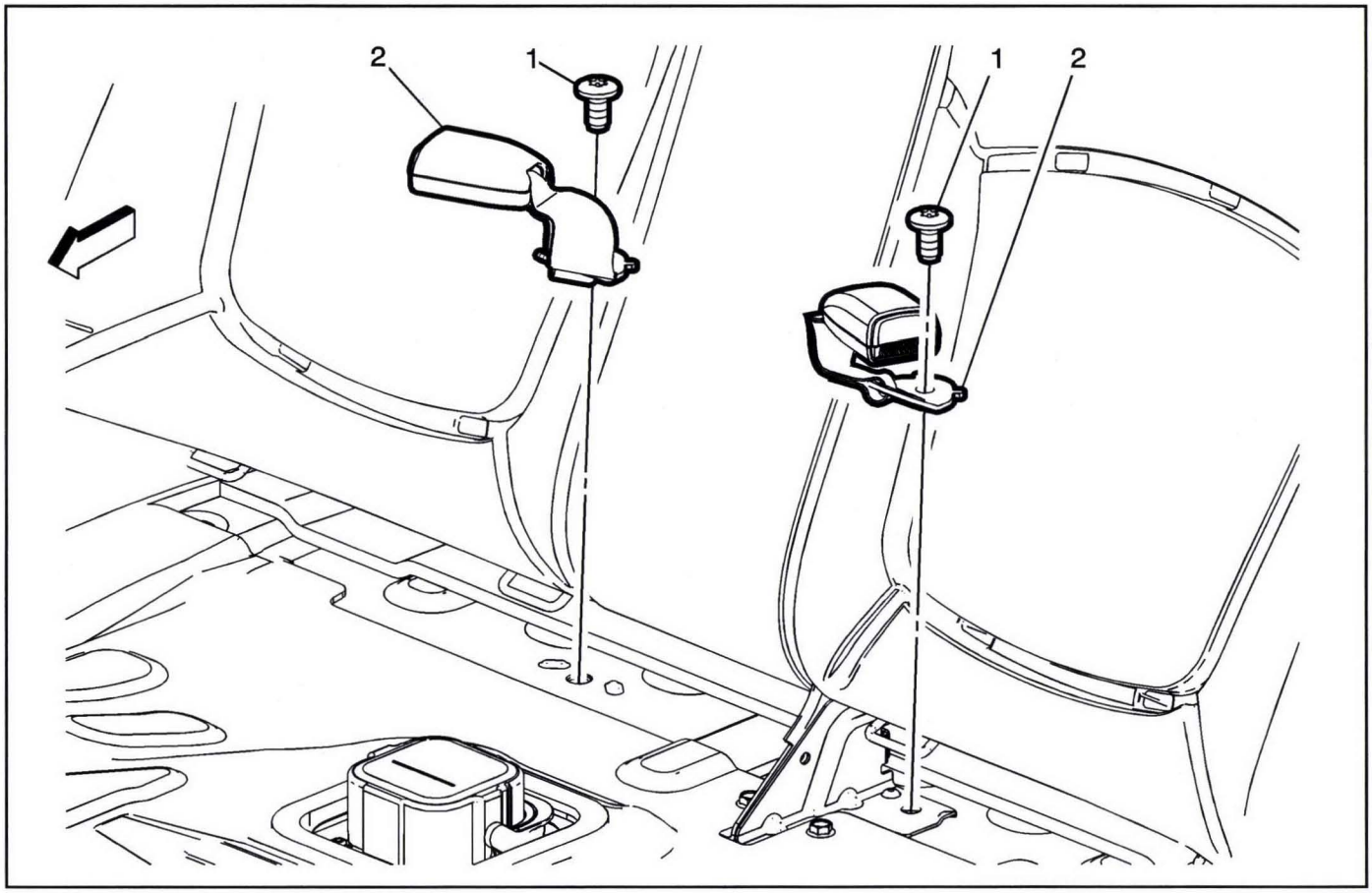
Front Seat Belt Buckle Replacement

Callout	Component Name
Preliminary Procedure Remove the driver or passenger seat. Refer to *Driver or Passenger Seat Removal and Installation on page 13-3.*	

Front Seat Belt Buckle Replacement (cont'd)

Callout	Component Name
1	Front Seat Belt Buckle Bolt **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 40 N•m (30 lb ft)
2	Front Seat Belt Buckle Assembly

Rear Seat Belt Buckle Replacement

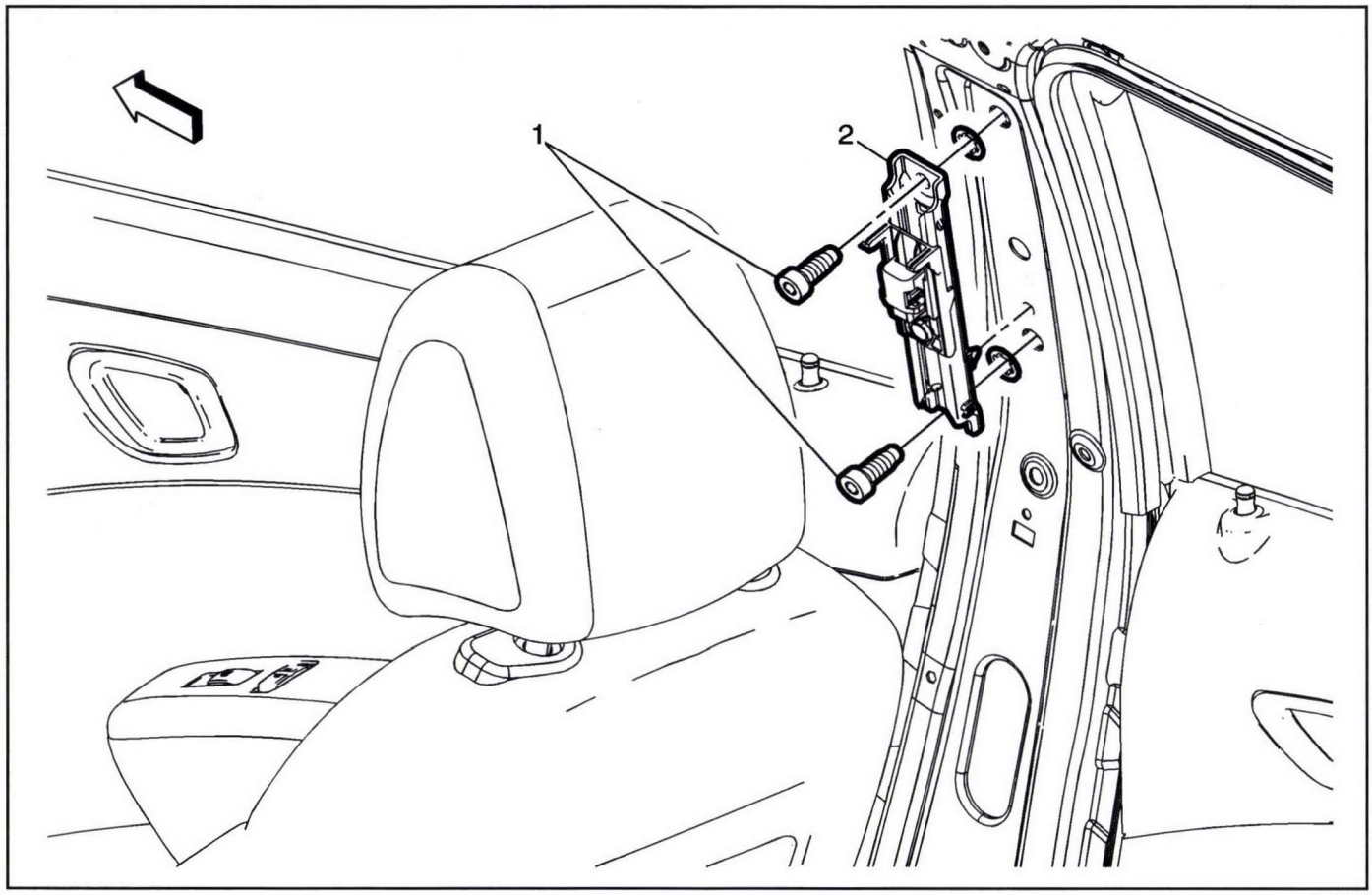


2969438

Rear Seat Belt Buckle Replacement

Callout	Component Name
Preliminary Procedure Remove the rear seat cushion. Refer to *Rear Seat Cushion Removal and Installation on page 13-21.*	
1	Rear Seat Belt Buckle Bolt **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 40 N•m (30 lb ft)
2	Rear Seat Belt Buckle Assembly

Front Seat Belt Guide Adjuster Replacement

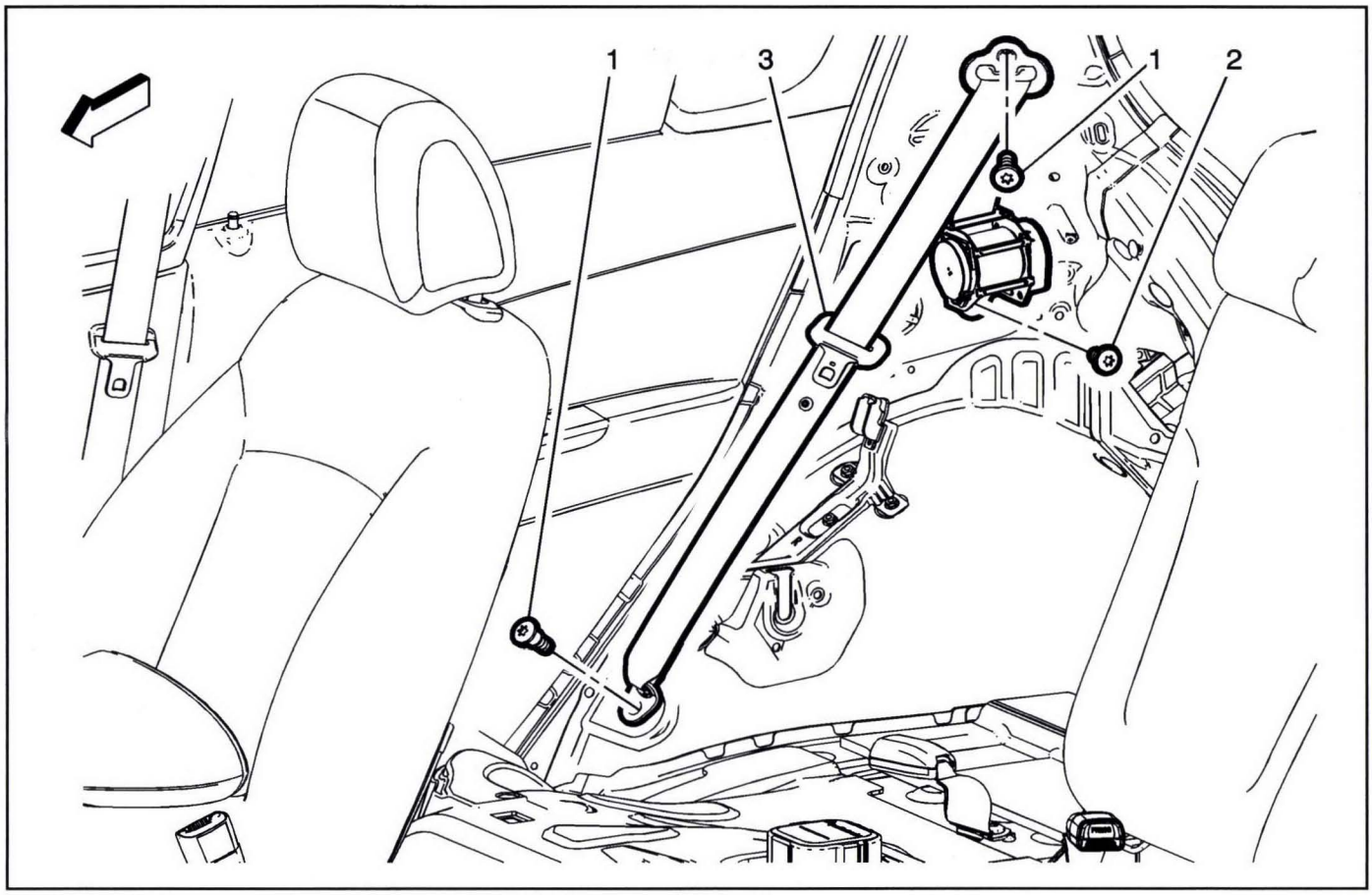


2969440

Front Seat Belt Guide Adjuster Replacement

Callout	Component Name
Preliminary Procedure Remover center pillar upper trim panel. Refer to *Center Pillar Upper Trim Panel Replacement on page 2-62*.	
1	Front Seat Belt Guide Adjuster Bolt (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 40 N•m (30 lb ft)
2	Front Seat Belt Guide Adjuster Assembly

Rear Seat Belt Retractor Replacement



2969441

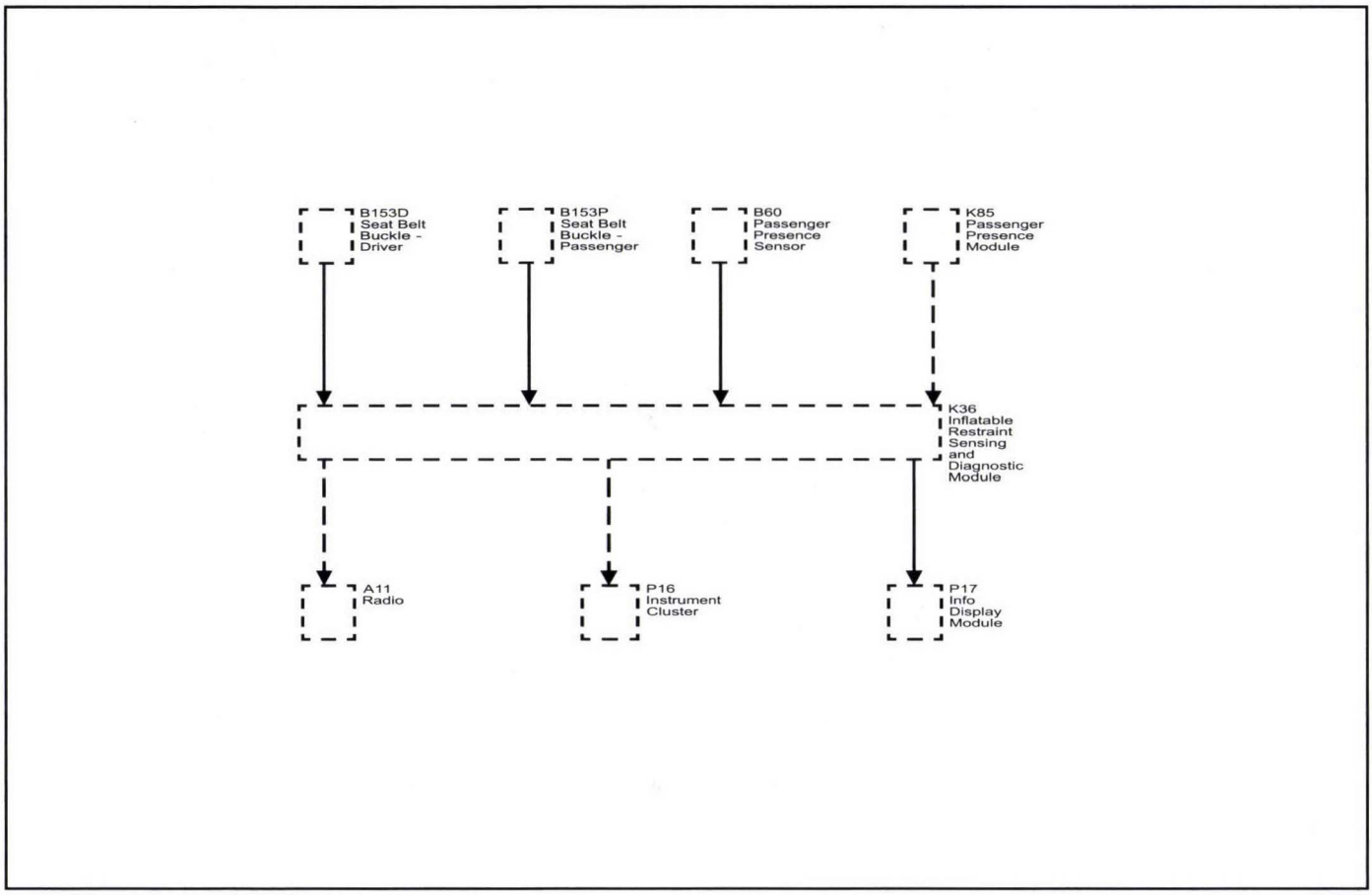
Rear Seat Belt Retractor Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the quarter lower rear trim panel. Refer to *Quarter Lower Rear Trim Panel Replacement on page 2-65*. 2. Remove the quarter window trim finish panel. Refer to *Quarter Window Trim Finish Panel Replacement on page 2-64*.	
1	Rear Seat Belt Anchor Bolt **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 40 N•m (30 lb ft)
2	Rear Seat Belt Retractor Bolt **Tighten** 40 N•m (30 lb ft)
3	Rear Seat Belt Retractor Assembly

Description and Operation

Seat Belt System Description and Operation

Seat Belt with P17 Info Display Module Block Diagram



3513723

Restraint System

Note: If the vehicle has been in a collision, refer to *Repairs and Inspections Required After a Collision on page 12-93*

The vehicle has front and rear seat belts that are the primary means of occupant restraint. Seat belts help to keep the occupants inside the passenger compartment and to gradually reduce the impact forces during the following events:

- Frontal impact type crashes
- Rear impact type crashes
- Side impact type crashes
- Roll-over type crashes

All seat belt retractors have emergency locks. The retractors remain unlocked during normal operation and under normal driving conditions. The retractors remain unlocked during normal conditions in order to allow free movement of the upper body of each occupant.
A pendulum locks the seat belt webbing into position. The pendulum causes a locking bar to engage a cog on the spool of the retractor mechanism when the following conditions occur:

- A rapid extraction of the seat belt webbing from the retractor
- An abrupt change in vehicle speed
- An abrupt change in vehicle direction
- Operation of the vehicle on a steep upgrade
- Operation of the vehicle on a downgrade

The seat belts have an automatic locking (cinch) feature. The cinch feature is activated when the seat belt webbing is completely extended from the retractor. The cinch feature prevents the webbing from extending beyond the position from which it is allowed to retract. Use of the cinch feature is recommended for securing a child seat. The cinch feature may be cancelled by allowing the webbing to wind back completely into the retractor. After the cinch feature is cancelled, the webbing is unlocked. After the cinch feature is cancelled, the webbing will extend from the retractor.
This vehicle is also equipped with a supplemental inflatable restraint (SIR) system. Refer to *Supplemental Inflatable Restraint System Description and Operation on page 12-182*

Front Seat Belt System

The front seat belt system includes a driver and passenger seat belt retractor pretensioner. Both front seat belt pretensioners includes a seat belt switch in the seat buckle which controls a reminder lamp and a tone alarm.

Note: The front passenger seat is equipped with a passenger presence sensor, which detects an occupant. If the passenger presence sensor detects an empty front passenger seat, then the passenger fasten safety belt indicator will be disabled.

- When the driver seat belt is buckled and the ignition switch is turned ON, the following events will occur:
  - The tone alarm will not operate.
  - The reminder lamp will not operate.
- When the passenger seat belt is buckled with an occupant sitting in the passenger front seat, then the ignition switch is turned ON, the following events will occur:
  - The tone alarm will not operate.
  - The reminder lamp, which is located within the Instrument Panel Multifunction Switch, will not be turned ON.
- When the driver seat belt is not buckled and the ignition switch is in the ON position, the following events will occur:
  - The tone alarm will operate for 4–8 seconds and then go OFF.
  - The fasten safety belt indicator will turn ON for 20 seconds, until the driver seat belt is buckled.
- When the passenger seat belt is not buckled with an occupant sitting in the passenger front seat, then the ignition switch is turned ON, the following events will occur:
  - The tone alarm will operate for 4–8 seconds and then go OFF.
  - The reminder lamp, which is located within the Instrument Panel Multifunction Switch, will be turned ON.

Rear Seat Belt System

The Rear Seat Belt System includes the following components:

- The rear seat belt retractor is located at the wheelhouse panel and attached to the floor panel by the rear seat shoulder belt retractor bracket.
- The rear seat belt buckles and the center seat belt buckle are attached to each seat.

Child Seat Restraint System

Warning: A child in a rear-facing child restraint can be seriously injured if the right-front passengers air bag inflates. This is because the back of a rear-facing child restraint would be very close to the inflating air bag. NEVER use a rear-facing child restraint in this vehicle. If a forward-facing child restraint is suitable for your child, ALWAYS move the front passenger seat as far back as it will go and then install the child restraint. Be sure the child restraint position does not conflict with any additional requirements provided by the manufacturer. For more information, refer to the vehicle owners manual and the instruction that came with the child restraint.

A child in a rear-facing child restraint can be seriously injured if the right-front passengers air bag inflates. This is because the back of a rear-facing child restraint would be very close to the inflating air bag. NEVER use a rear-facing child restraint in this vehicle. If a forward-facing child restraint is suitable for your child, ALWAYS move the front passenger seat as far back as it will go and then install the child restraint. Be sure the child restraint position does not conflict with any additional requirements provided by the manufacturer. For more information, refer to the vehicle owners manual and the instruction that came with the child restraint.

The child seat may only be used in a forward facing seating location. The child seat should be installed and secured according to the manufacturer's directions. If the child seat has a top strap, the seat will need to be anchored. Passengers should not be allowed to sit at locations where the seat belts are being used to secure the child seat.

All vehicles are equipped with a dual-mode type retractor with emergency and automatic locking features. The automatic locking feature is for restraint of a child seat. The child seat can be secured by pulling the seat belt all the way out to lock it. Then tighten the seat belt around the child seat.

If a child seat is to be used in the second seat position, a special dealer-installed anchor must be used in order to anchor the child seat top strap. This only applies to the seats designed with the top strap provision and for the vehicles sold in Canada. In order to ensure the correct top strap angle, the child seat is only to be used at the seating position for which the top strap anchor is installed.

Fasten Safety Belt Indicators

There are two fasten safety belt indicators for this vehicle. The driver fasten safety belt reminder is displayed in the instrument cluster, and the passenger fasten safety belt reminder is displayed in the Instrument Panel Multifunction Switch. The fasten safety belt indicator may only be ON during RUN. The fasten safety belt indicator illuminates under the following conditions:

- During the bulb check
- The inflatable restraint sensing and diagnostic module (SDM) sends the status of the driver seat belt to the instrument cluster via serial data. The passenger seat belt status is sent to the Instrument Panel Multifunction Switch via a hard wire. If any of the seat belts are unfastened, the instrument cluster will send a message requesting a chime sound to be turned ON after a bulb check.

Supplemental Inflatable Restraints

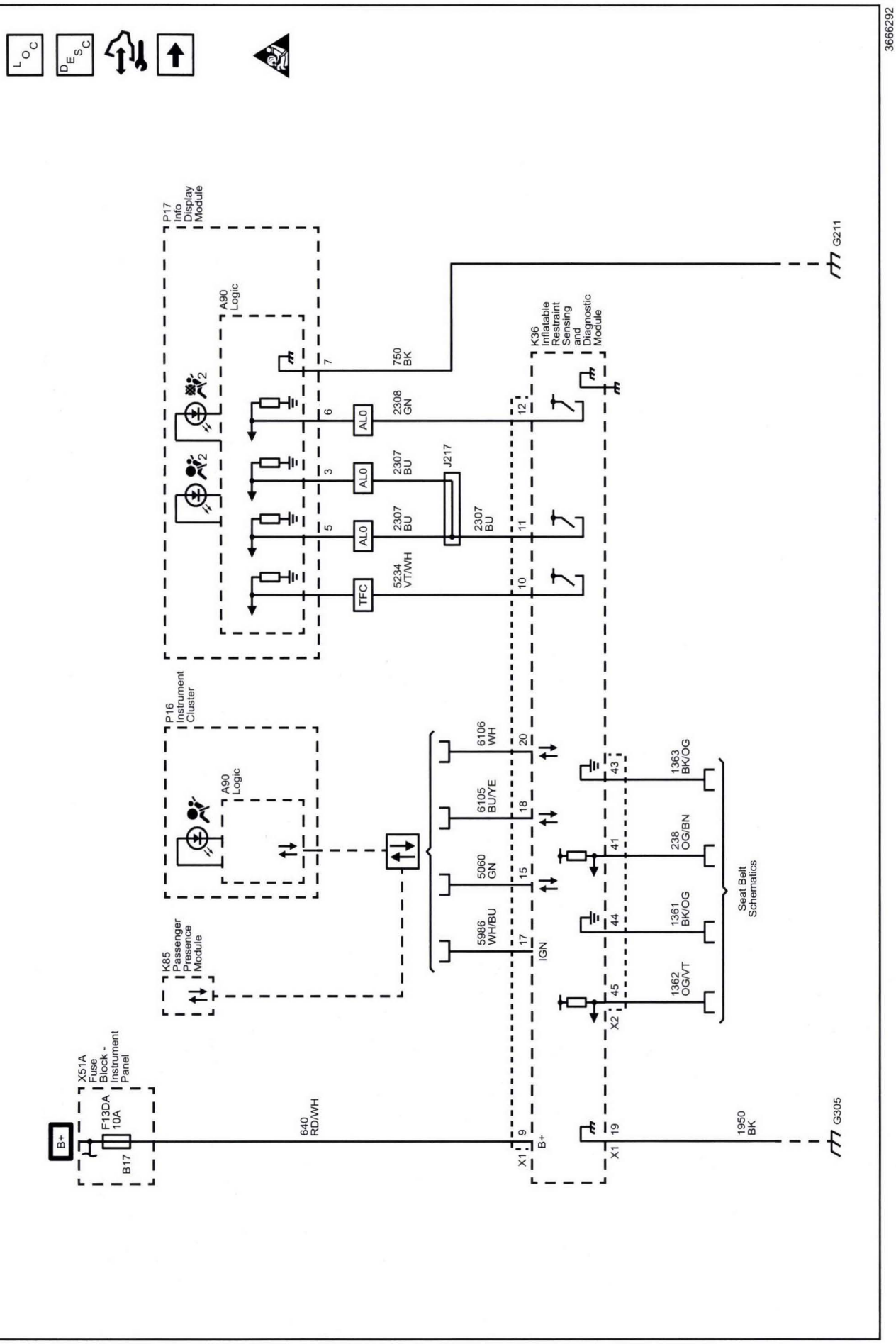
Specifications

Fastener Tightening Specifications

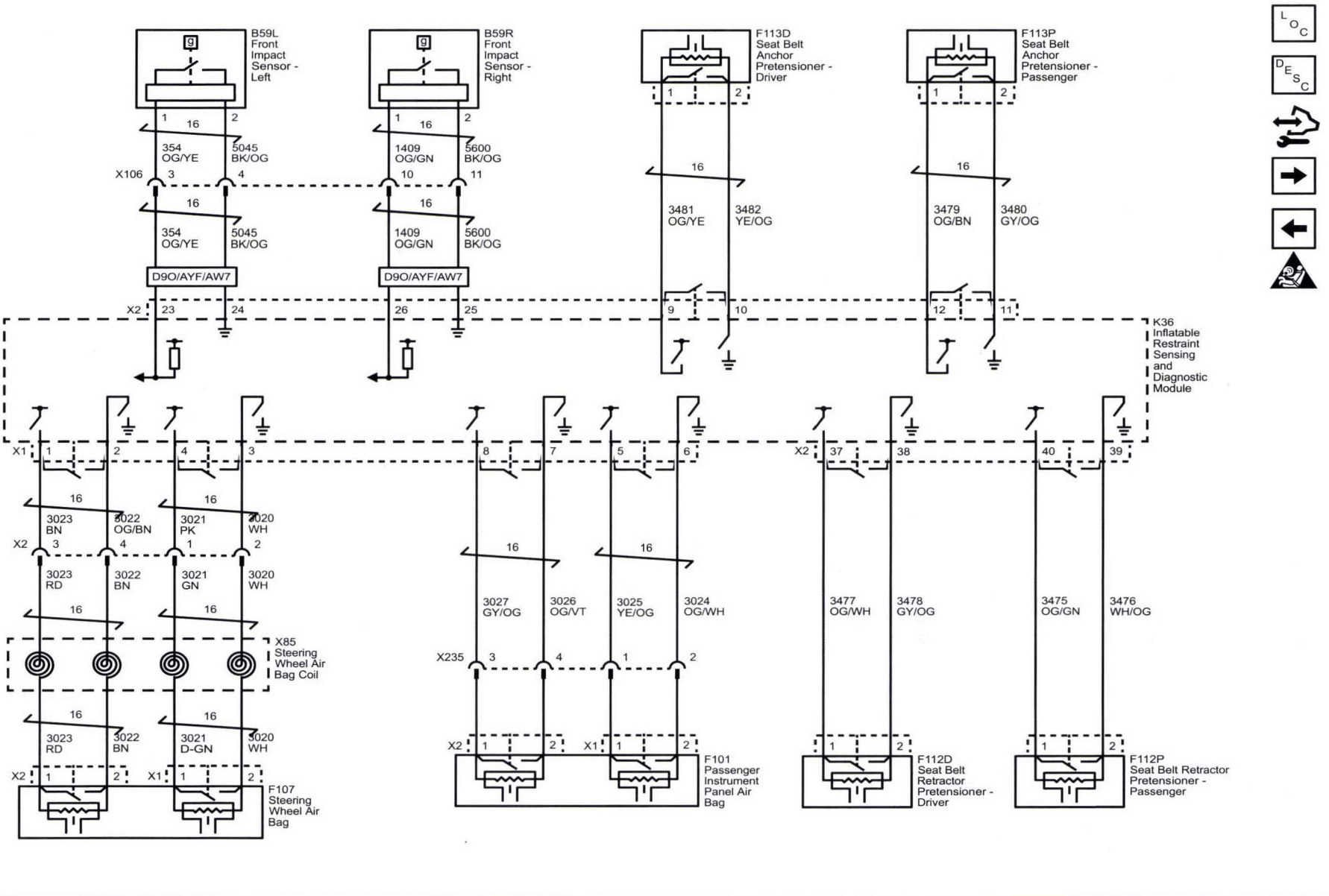
Application	Specification	
	Metric	English
Front And Rear Row Seat Roof Rail Fastener	10 N•m	89 lb in
Front End Inflatable Restraint Discriminating Sensor	7.5 N•m	66 lb in
Front Seat Belt Anchor Bolt	40 N•m	30 lb ft
Front Seat Belt Anchor Plate Tensioner Fastener	40 N•m	30 lb ft
Front Seat Belt Retractor Bolt	40 N•m	30 lb ft
Front Seat Belt Tensioner Anchor Bolt	5 N•m	44 lb in
Front Seat Outboard Seat Back Airbag Nut	4 N•m	36 lb in
Inflatable Restraint Instrument Panel Lower Module Fastener	10 N•m	89 lb in
Inflatable Restraint Sensing and Diagnostic Module Bolt	10 N•m	89 lb in
Inflatable Restraint Side Impact Sensor	7.5 N•m	66 lb in
Instrument Panel Inflatable Restraint Module Fastener	10 N•m	89 lb in
Instrument Panel Lower Airbag Bracket Fastener	5 N•m	44 lb in
Rear Seat Bolster Airbag Bolt	3.5 N•m	31 lb in
Rear Seat Bolster Airbag Nut	3.5 N•m	31 lb in

Schematic and Routing Diagrams

SIR Schematics (Power, Ground, Serial Data, and Indicators)

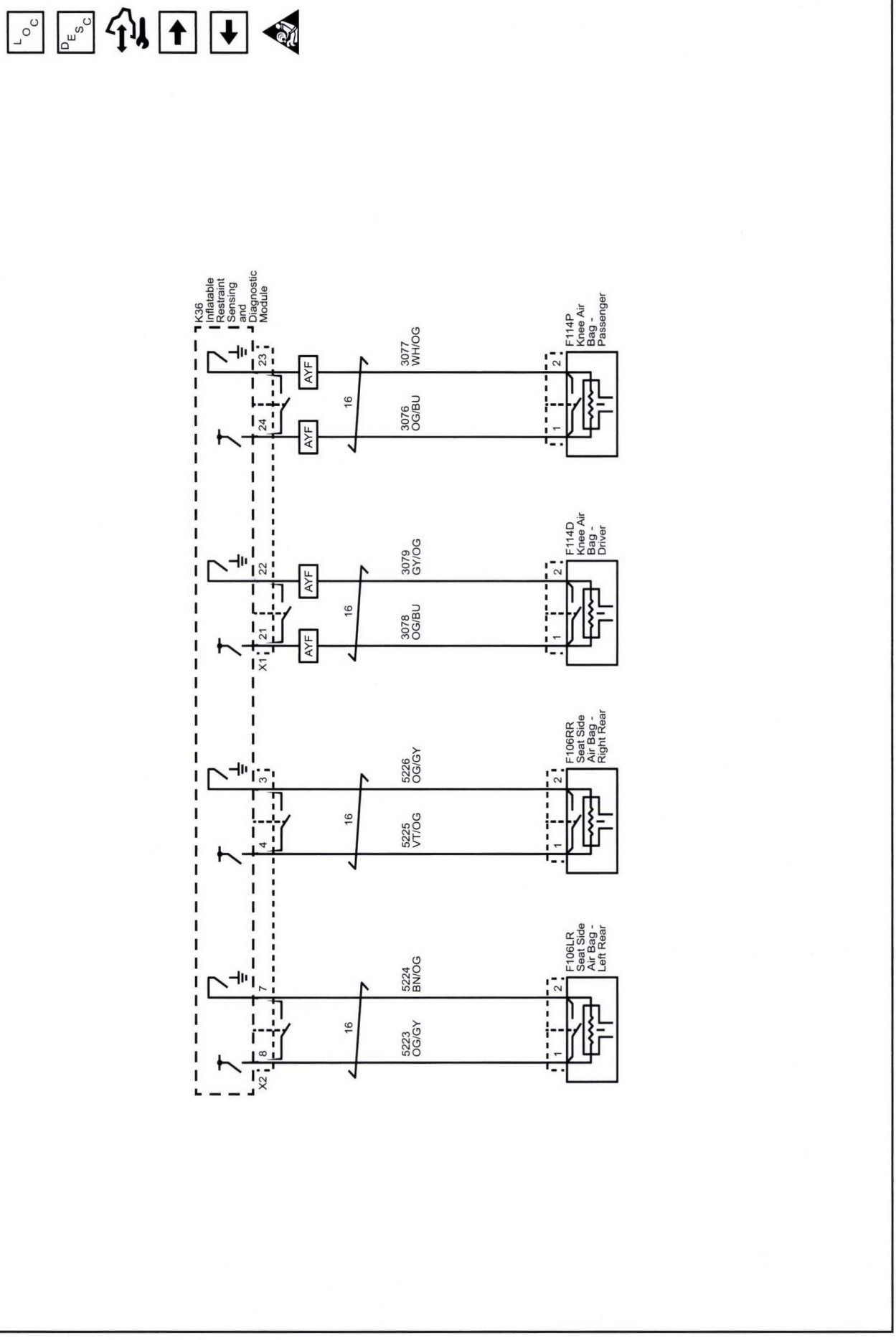


SIR Schematics (Front Impact Sensors, Seat Belt Retractor and Anchor Pretensioners, Driver and Passenger Air Bags)

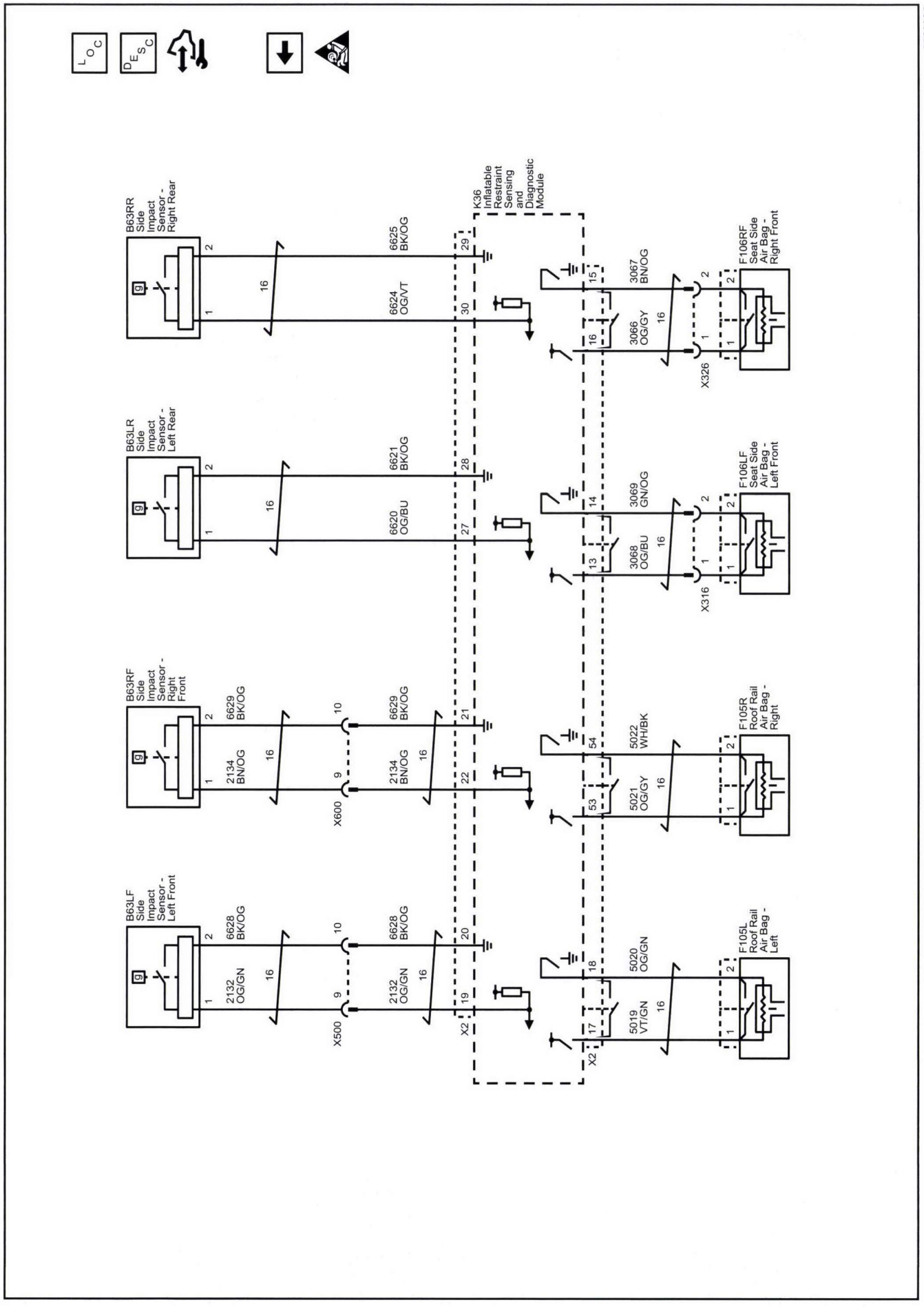


3666293

SIR Schematics (Knee and Rear Seat Air Bags)



SIR Schematics (Side Impact Sensors, Seat and Roof Air Bags)



Diagnostic Information and Procedures

DTC B0012 or B0013

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0012: Driver Steering Wheel Air Bag Deployment Loop Stage 1

DTC B0013: Driver Steering Wheel Air Bag Deployment Loop Stage 2

For symptom byte information, refer to *Symptom Byte List on page 6-117*.

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Driver Steering Wheel Air Bag Stage 1 High Control	B0012 02, B0012 0E	B0012 0D	B0012 04, B0012 0D	B0012 01	—
Driver Steering Wheel Air Bag Stage 1 Low Control	B0012 02, B0012 0E	B0012 0D	B0012 04, B0012 0D	B0012 01	—
Driver Steering Wheel Air Bag Stage 2 High Control	B0013 02, B0013 0E	B0013 0D	B0013 04, B0013 0D	B0013 01	—
Driver Steering Wheel Air Bag Stage 2 Low Control	B0013 02, B0013 0E	B0013 0D	B0013 04, B0013 0D	B0013 01	—

Circuit/System Description

During a frontal crash of sufficient force the Inflatable Restraint Sensing and Diagnostic Module (SDM) will allow current to flow through the deployment loop in order to deploy the Steering Wheel Air Bag. The Inflatable Restraint Sensing and Diagnostic Module performs continuous diagnostic tests on the deployment loops to check for proper circuit continuity and for shorts to ground or voltage. There are 2 shorting bars used within the Steering Wheel Air Bag coil connector which will short together both Steering Wheel Air Bag stage 1 high control circuit and Steering Wheel Air Bag stage 1 low control circuit and both Steering Wheel Air Bag stage 2 high control circuit and Steering Wheel Air Bag stage 2 low control circuit when the connector is disconnected. This will help to prevent unwanted deployment of the Steering Wheel Air Bag during servicing.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

B0012 01 stage 1 or B0013 01 stage 2

The Steering Wheel Air Bag deployment loop is shorted to voltage for 2 seconds.

B0012 02 stage 1 or B0013 02 stage 2

The Steering Wheel Air Bag deployment loop is shorted to ground for 2 seconds.

B0012 04 stage 1 or B0013 04 stage 2

The Steering Wheel Air Bag deployment loop is open for 2 seconds.

B0012 0D stage 1 or B0013 0D stage 2

The Steering Wheel Air Bag deployment loop resistance is greater than 4.4 Ω for 2 seconds.

B0012 0E stage 1 or B0013 0E stage 2

The Steering Wheel Air Bag deployment loop resistance is less than 1.7 Ω for 2 seconds.

Action Taken When the DTC Sets

- The Inflatable Restraint Sensing and Diagnostic Module requests the instrument cluster to illuminate the AIR BAG indicator.
- The Inflatable Restraint Sensing and Diagnostic Module will store a DTC, however if an event occurs the system will still attempt deployment.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer exists.
- A history DTC will clear once 100 malfunction-free ignition cycles have occurred.

Diagnostic Aid

Note: The following diagnostic aids apply for both current and history DTCs.

A worn Steering Wheel Air Bag coil can cause a repeated history DTC to set. To verify this condition, turn the steering wheel 360 degrees in one direction then back 360 degrees in the other direction, multiple times, while viewing the scan tool Deployment Loop Resistance parameters.

An incorrectly installed CPA or incorrectly seated connector can cause a shorting bar to short both control circuits together. Check the connectors and CPAs if a DTC with symptom byte 02 or 0E is set, to ensure the shorting bars are not causing the circuits to be shorted together. Shorting bars are used in the locations listed below:

- Steering wheel air bag assembly
- Steering wheel air bag coil assembly
- Inline connectors – on the steering wheel air bag side of the harness connector
- Harness side of the inflatable restraint sensing and diagnostic module connector

Terminal fretting or incorrectly seated connector can cause an open/high resistance condition. Check the circuit terminals for fretting or incorrectly seated connector if a DTC with symptom byte 04 or 0D is set.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*
- *Connector Repairs on page 11-895*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-38125-580 Terminal Release Tool Kit

Circuit/System Verification

Note:

- Refer to *SIR Service Precautions on page 12-152*
- Inspect all terminals for damage or corrosion when disconnecting connectors. Damage or corrosion in the following requires repair or replacement of the affected component/connector.
  - Steering wheel air bag
  - Steering wheel air bag coil
  - Inflatable restraint sensing and diagnostic module
  - Air bag wiring harness connector
  - Inflatable restraint sensing and diagnostic module wiring harness connector
- The connector and connector position assurance (CPA) may seat independent of each other. Both the connector and CPA should seat with an audible and/or tactile click. The CPA isolates the shorting-bars within the connector allowing the deployment circuit to operate properly.
- If the condition is intermittent or cannot be duplicated, disconnect the connectors and add dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087). This procedure will correct the high resistance condition due to terminal fretting corrosion.

1. Verify the scan tool Deployment Loop Resistance parameters stay consistently between 2.1 and 4.0 Ω without any spikes or dropouts while turning the steering wheel 360 degrees in one direction then back 360 degrees in the other direction.

⇒ **If less than 2.1 or greater than 4.0 Ω**

Refer to Circuit/System Testing.

⇒ **If there are spikes or dropouts**

Replace the X85 Steering Wheel Air Bag Coil.

⇓ **If within 2.1 and 4.0 Ω without any spikes or dropouts**

2. Verify DTC B0012 or B0013 is set as a current DTC.

⇒ **If the DTC is set as current**

Refer to Circuit/System Testing.

⇓ **If the DTC is set as history**

3. Verify the scan tool Deployment Loop Resistance parameters stay consistently between 2.1 and 4.0 Ω without any drop outs or spikes while moving the harness near each connector listed below.
   - X85 Steering Wheel Air Bag Coil
   - F107 Steering Wheel Air Bag

- Any harness inline
- K36 Inflatable Restraint Sensing and Diagnostic Module

⇒ **If the reading is erratic while moving the harness, perform the following:**

- Inspect each connector terminal for damage or corrosion and repair as necessary.
- Apply dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087) to each connector terminal.
- Insure each connector and CPA is correctly seated.

⇓ **If within 2.1 and 4.0 Ω without any spikes or dropouts**

4. All OK

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the X1 harness connector at the F107 Steering Wheel Air Bag. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for greater than 25 Ω between the control circuit terminals 1 and 2 (Stage 1) or terminals 4 and 5 (Stage 2).

⇒ **If 25 Ω or less**

2.1. Disconnect the X1 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

Note: Some connectors may be equipped with shorting bars as a safety component to prevent accidental inflator deployment. When testing on a connector with shorting bars, the shorting bars must be disabled to ensure accurate test results. Insert an appropriate pick from *EL-38125-580* and depress the shorting bars above the appropriate terminals. This will lift the shorting bar from the terminal and allow accurate test results. Take care not to damage the connector, shorting bar, or terminal when depressing the shorting bar.

2.2. Test for infinite resistance between the two control circuits.

⇒ If less than infinite resistance, repair the short between the two circuits.

⇒ If infinite resistance, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If greater than 25 Ω**

3. Vehicle in Service Mode.
4. Test for less than 11 V between the control circuit terminals listed below and ground:
   - Control circuit terminal 1
   - Control circuit terminal 2

⇒ **If 11 V or greater**

4.1. Vehicle OFF, disconnect the X1 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module, vehicle in Service Mode.

4.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 11 V**

5. Vehicle OFF.
6. Test for greater than 25 Ω between the control circuit terminals listed below and ground:
   - Control circuit terminal 1
   - Control circuit terminal 2

⇒ **If 25 Ω or less**

6.1. Disconnect the X1 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

Note: Some connectors may be equipped with shorting bars as a safety component to prevent accidental deployment. When testing on a connector with shorting bars, the shorting bars must be disabled to ensure accurate test results. Insert an appropriate pick from *EL-38125-580* and depress the shorting bars above the appropriate terminals. This will lift the shorting bar from the terminal and allow accurate test results. Take care not to damage the connector, shorting bar, or terminal when depressing the shorting bar.

6.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If greater than 25 Ω**

7. Install a 3 A fused jumper wire between the control circuit terminals 1 and 2 (Stage 1) or terminals 4 and 5 (Stage 2).

8. Vehicle in Service Mode, verify the scan tool Deployment Loop Resistance parameter is consistently less than 2 Ω while turning the steering wheel 360 degrees in one direction then back 360 degrees in the other direction.

⇒ **If the reading is erratic while turning the steering wheel**

Replace the X85 Steering Wheel Air Bag Coil.

⇒ **If 2 Ω or greater**

8.1. Vehicle OFF, disconnect the X1 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

8.2. Test for less than 2 Ω in the X85 Steering Wheel Air Bag Coil and each control circuit end to end.

⇒ If 2 Ω or greater, replace the X85 Steering Wheel Air Bag Coil or repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 2 Ω**

9. Vehicle OFF, connect the harness connector at the F107 Steering Wheel Air Bag, press in the CPA (if equipped) until an audible and/or tactile click is heard.
10. Vehicle in Service Mode, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.
11. Verify DTC B0012 or B0013 is not set.

⇒ **If DTC B0012 or B0013 is set**

Replace the F107 Steering Wheel Air Bag.

⇓ **If DTC B0012 or B0013 is not set**

12. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Steering Wheel Airbag Replacement on page 12-155*
- *Steering Wheel Airbag Coil Replacement on page 12-158*
- *Control Module References on page 6-3* for inflatable restraint sensing and diagnostic module replacement, programming and setup

DTC B0014, B0021, B0031, or B0038

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0014 01: Driver Seat Side Air Bag Deployment Loop Short to Battery
DTC B0014 02: Driver Seat Side Air Bag Deployment Loop Short to Ground
DTC B0014 04: Driver Seat Side Air Bag Deployment Loop Open
DTC B0014 0D: Driver Seat Side Air Bag Deployment Loop High Resistance
DTC B0014 0E: Driver Seat Side Air Bag Deployment Loop Low Resistance
DTC B0021 01: Passenger Seat Side Air Bag Deployment Loop Short to Battery
DTC B0021 02: Passenger Seat Side Air Bag Deployment Loop Short to Ground
DTC B0021 04: Passenger Seat Side Air Bag Deployment Loop Open
DTC B0021 0D: Passenger Seat Side Air Bag Deployment Loop High Resistance
DTC B0021 0E: Passenger Seat Side Air Bag Deployment Loop Low Resistance
DTC B0031 01: Left Rear Seat Side Air Bag Deployment Loop Short to Battery
DTC B0031 02: Left Rear Seat Side Air Bag Deployment Loop Short to Ground
DTC B0031 04: Left Rear Seat Side Air Bag Deployment Loop Open
DTC B0031 0D: Left Rear Seat Side Air Bag Deployment Loop High Resistance
DTC B0031 0E: Left Rear Seat Side Air Bag Deployment Loop Low Resistance
DTC B0038 01: Right Rear Seat Side Air Bag Deployment Loop Short to Battery
DTC B0038 02: Right Rear Seat Side Air Bag Deployment Loop Short to Ground
DTC B0038 04: Right Rear Seat Side Air Bag Deployment Loop Open
DTC B0038 0D: Right Rear Seat Side Air Bag Deployment Loop High Resistance
DTC B0038 0E: Right Rear Seat Side Air Bag Deployment Loop Low Resistance

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Left Front Seat Air Bag High Control	B0014 02, B0014 0E	B0014 0D	B0014 04, B0014 0D	B0014 01	—
Left Front Seat Air Bag Low Control	B0014 02, B0014 0E	B0014 0D	B0014 04, B0014 0D	B0014 01	—
Right Front Seat Air Bag High Control	B0021 02, B0021 0E	B0021 0D	B0021 04, B0021 0D	B0021 01	—
Right Front Seat Air Bag Low Control	B0021 02, B0021 0E	B0021 0D	B0021 04, B0021 0D	B0021 01	—
Left Rear Seat Air Bag High Control	B0031 02, B0031 0E	B0031 0D	B0031 04, B0031 0D	B0031 01	—
Left Rear Seat Air Bag Low Control	B0031 02, B0031 0E	B0031 0D	B0031 04, B0031 0D	B0031 01	—
Right Rear Seat Air Bag High Control	B0038 02, B0038 0E	B0038 0D	B0038 04, B0038 0D	B0038 01	—
Right Rear Seat Air Bag Low Control	B0038 02, B0038 0E	B0038 0D	B0038 04, B0038 0D	B0038 01	—

Circuit/System Description

During a side or frontal crash of sufficient force, the Inflatable Restraint Sensing and Diagnostic Module (SDM) will allow current to flow through the deployment loop in order to deploy an air bag. There are 2 shorting bars used within the connector that will short the control circuits together when the connector is disconnected. This will help to prevent unwanted deployment of the air bag or retractor pretensioner during servicing.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

B0014 01, B0021 01, B0031 01, B0038 01

The air bag control circuit is shorted to voltage for 2 seconds.

B0014 02, B0021 02, B0031 02, B0038 02

The air bag control circuit is shorted to ground for 2 seconds.

B0014 04, B0021 04, B0031 04, B0038 04

The air bag control circuit is open for 2 seconds.

B0014 0D, B0021 0D, B0031 0D, B0038 0D

The air bag deployment loop resistance is greater than 4.2 Ω for 2 seconds.

B0014 0E, B0021 0E, B0031 0E, B0038 0E

The air bag deployment loop resistance is less than 1.4 Ω for 2 seconds.

Action Taken When the DTC Sets

- The Inflatable Restraint Sensing and Diagnostic Module requests the instrument cluster to illuminate the AIR BAG indicator.
- The Inflatable Restraint Sensing and Diagnostic Module will store a DTC, however if an event occurs the system will still attempt deployments.

Conditions for Clearing the DTC

- The condition for setting the DTC no longer exists.
- A history DTC will clear once 100 malfunction-free ignition cycles have occurred.

Diagnostic Aid

Note: The following diagnostic aids apply for both current and history DTCs.

An incorrectly installed connector position assurance (CPA) or incorrectly seated connector can cause a shorting bar to short both control circuits together. Check the connectors and CPAs if a DTC with symptom byte 02 or 0E is set, to ensure the shorting bars are not causing the circuits to be shorted together. Shorting bars are used in the locations listed below:

- Front and rear seat side air bags
- Left and right roof rail air bags
- Inline harness connectors
- Harness side of the Inflatable Restraint Sensing and Diagnostic Module connector

Terminal fretting or incorrectly seated connector can cause an open/high resistance condition. Check the circuit terminals for fretting or incorrectly seated connector if a DTC with symptom byte 04 or 0D is set. DTCs of deployment loops which are in the seat can occur because of stress or damage to the harness due to seat movement. Move the seat to the full extent of travel while using the scan tool to observe deployment type loop parameters.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*
- *Connector Repairs on page 11-895*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-38125-580 Terminal Release Tool Kit

Circuit/System Verification

Note:

- Refer to *SIR Service Precautions on page 12-152*.
- Inspect all terminals for damage or corrosion when disconnecting connectors. Damage or corrosion in the following requires repair or replacement of the affected component/connector.
  - Seat Side Air Bag
  - Inflatable Restraint Sensing and Diagnostic Module
  - All wiring harness connectors
  - Inflatable Restraint Sensing and Diagnostic Module wiring harness connector
- The connector and connector position assurance (CPA) may seat independent of each other. Both the connector and CPA should seat with an audible and/or tactile click. The CPA isolates the shorting-bars within the connector allowing the deployment circuit to operate properly.
- If the condition is intermittent or cannot be duplicated, disconnect the connectors and add dielectric grease/lubricant (Nyogel 760G or

equivalent, meeting GM specification 9986087). This procedure will correct the high resistance condition due to terminal fretting corrosion.

1. Verify the appropriate scan tool Deployment Loop Resistance parameters stay consistently between 2.1–4.0 Ω without any spikes or dropouts while moving the harness near each connector.
   - F106 Seat Side Air Bag
   - Any inline harness connector
   - K36 Inflatable Restraint Sensing and Diagnostic Module

⇒ **If less than 2.1 Ω or greater than 4.0 Ω**

Refer to Circuit/System Testing.

⇒ **If there are spikes or dropouts, perform the following:**

- Inspect each connector terminal and harness for damage or corrosion and repair as necessary.
- Apply dielectric grease/lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087) to each connector terminal.
- Ensure each connector and CPA is correctly seated.

⇓ **If between 2.1–4.0 Ω without any spikes or dropouts**

2. All OK

Circuit/System Testing

1. Vehicle OFF, scan tool disconnected, disconnect the harness connector at the appropriate F106 Seat Side Air Bag.
2. Test for greater than 25 Ω between the control circuit terminals 1 and 2.

⇒ **If 25 Ω or less**

2.1. Disconnect the X2 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

Note: Some connectors may be equipped with shorting bars as a safety component to prevent accidental deployment. When testing on a connector with shorting bars, the shorting bars must be disabled to ensure accurate test results. Insert an appropriate pick from EL-38125-580 and depress the shorting bars above the appropriate terminals. This will lift the shorting bar from the terminal and allow accurate test results. Take care not to damage the connector, shorting bar, or terminal when depressing the shorting bar.

2.2. Test for infinite resistance between the 2 control circuits.

⇒ If less than infinite resistance, repair the short between the 2 circuits.

⇒ If infinite resistance, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If greater than 25 Ω**

3. Vehicle ON.
4. Test for less than 11 V between each control circuit terminal listed below and ground:
   - Control circuit terminal 1
   - Control circuit terminal 2

⇒ **If 11 V or greater**

4.1. Vehicle OFF, disconnect the X2 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module, Vehicle ON.

4.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 11 V**

5. Vehicle OFF.
6. Test for greater than 25 Ω between each control circuit terminal listed below and ground:
   - Control circuit terminal 1
   - Control circuit terminal 2

⇒ **If 25 Ω or less**

6.1. Disconnect the X2 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

6.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If greater than 25 Ω**

7. Install a 3 A fused jumper wire between the control circuit terminals 1 and 2, Vehicle ON.
8. Verify the appropriate scan tool Deployment Loop Resistance parameter is less than 2 Ω.

⇒ **If 2 Ω or greater**

8.1. Vehicle OFF, disconnect the X2 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

8.2. Test for less than 2 Ω in each control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 2 Ω**

9. Vehicle OFF, connect the harness connector at the F106 Seat Side Air Bag, press in the CPA (if equipped) until an audible and/or tactile click is heard.
10. Vehicle ON, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.

11. Verify DTC B0014, B0021, B0031, or B0038 is not set.

⇒ **If DTC B0014, B0021, B0031, or B0038 is set**

Replace the F106 Seat Side Air Bag.

⇓ **If DTC B0014, B0021, B0031, or B0038 is not set**

12. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Front Seat Outboard Seat Back Airbag Replacement on page 12-164*
- *Rear Seat Bolster Airbag Replacement on page 12-165*
- *Control Module References on page 6-3* for Inflatable Restraint Sensing and Diagnostic Module replacement, programming, and setup

DTC B0015, B001A, B001B, or B0022

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0015 01: Driver Seat Belt Retractor Pretensioner Deployment Loop Short to Battery
DTC B0015 02: Driver Seat Belt Retractor Pretensioner Deployment Loop Short to Ground
DTC B0015 04: Driver Seat Belt Retractor Pretensioner Deployment Loop Open
DTC B0015 0D: Driver Seat Belt Retractor Pretensioner Deployment Loop High Resistance
DTC B0015 0E: Driver Seat Belt Retractor Pretensioner Deployment Loop Low Resistance
DTC B001A 01: Driver Seat Belt Anchor Pretensioner Deployment Loop Short to Battery
DTC B001A 02: Driver Seat Belt Anchor Pretensioner Deployment Loop Short to Ground
DTC B001A 04: Driver Seat Belt Anchor Pretensioner Deployment Loop Open
DTC B001A 0D: Driver Seat Belt Anchor Pretensioner Deployment Loop High Resistance
DTC B001A 0E: Driver Seat Belt Anchor Pretensioner Deployment Loop Low Resistance
DTC B001B 01: Passenger Seat Belt Anchor Pretensioner Deployment Loop Short to Battery
DTC B001B 02: Passenger Seat Belt Anchor Pretensioner Deployment Loop Short to Ground
DTC B001B 04: Passenger Seat Belt Anchor Pretensioner Deployment Loop Open
DTC B001B 0D: Passenger Seat Belt Anchor Pretensioner Deployment Loop High Resistance
DTC B001B 0E: Passenger Seat Belt Anchor Pretensioner Deployment Loop Low Resistance
DTC B0022 01: Passenger Seat Belt Retractor Pretensioner Deployment Loop Short to Battery
DTC B0022 02: Passenger Seat Belt Retractor Pretensioner Deployment Loop Short to Ground
DTC B0022 04: Passenger Seat Belt Retractor Pretensioner Deployment Loop Open Circuit
DTC B0022 0D: Passenger Seat Belt Retractor Pretensioner Deployment Loop High Resistance
DTC B0022 0E: Passenger Seat Belt Retractor Pretensioner Deployment Loop Low Resistance

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Driver Seat Belt Retractor Pretensioner High Control	B0015 02, B0015 0E	B0015 0D	B0015 04, B0015 0D	B0015 01	—
Driver Seat Belt Retractor Pretensioner Low Control	B0015 02, B0015 0E	B0015 0D	B0015 04, B0015 0D	B0015 01	—
Driver Seat Belt Anchor Pretensioner Low Control	B001A 02, B001A 0E	B001A 0D	B001A 04	B001A 01	—
Driver Seat Belt Anchor Pretensioner High Control	B001A 02, B001A 0E	B001A 0D	B001A 04	B001A 01	—
Passenger Seat Belt Anchor Pretensioner Low Control	B001B 02, B001B 0E	B001B 0D	B001B 04	B001B 01	—
Passenger Seat Belt Anchor Pretensioner High Control	B001B 02, B001B 0E	B001B 0D	B001B 04	B001B 01	—
Passenger Seat Belt Retractor Pretensioner High Control	B0022 02, B0022 0E	B0022 0D	B0022 04, B0022 0D	B0022 01	—
Passenger Seat Belt Retractor Pretensioner Low Control	B0022 02, B0022 0E	B0022 0D	B0022 04, B0022 0D	B0022 01	—

Circuit/System Description

During a side or frontal crash of sufficient force the inflatable restraint sensing and diagnostic module (SDM) will allow current to flow through the deployment loop in order to deploy an air bag or pretensioner. There are 2 shorting bars which will short together control circuits, when the connector is disconnected. This will help to prevent unwanted deployment of the air bag or pretensioner during servicing.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

B0015 01, B001A 01, B001B 01, B0022 01

The pretensioner control circuit is shorted to voltage for 2 seconds.

B0015 02, B001A 02, B001B 02, B0022 02

The pretensioner control circuit is shorted to ground for 2 seconds.

B0015 04, B001A 04, B001B 04, B0022 04

The pretensioner control circuit is open for 2 seconds.

B0015 0D, B001A 0D, B001B 0D, B0022 0D

The pretensioner deployment loop resistance is greater than 4.2 Ω for 2 seconds.

B0015 0E, B001A 0E, B001B 0E, B0022 0E

The pretensioner deployment loop resistance is less than 1.4 Ω for 2 seconds.

Action Taken When the DTC Sets

- The inflatable restraint sensing and diagnostic module requests the instrument cluster to illuminate the AIR BAG indicator.
- The inflatable restraint sensing and diagnostic module will store a DTC, however if an event occurs the system will still attempt deployments.

Conditions for Clearing the DTC

- The condition for setting the DTC no longer exists.
- A history DTC will clear once 100 malfunction-free ignition cycles have occurred.

Diagnostic Aid

Note: The following diagnostic aids apply for both current and history DTCs.

An incorrectly installed CPA or incorrectly seated connector can cause a shorting bar to short both control circuits together. Check the connectors and CPAs if a DTC with symptom byte 02 or 0E is set, to ensure the shorting bars are not causing the circuits to be shorted together. Shorting bars are used in the locations listed below:

- Driver and passenger anchor or retractor pretensioners
- Inline connectors - on the side of the harness connector
- Harness side of the inflatable restraint sensing and diagnostic module connector

Terminal fretting or incorrectly seated connectors can cause an open/high resistance condition. Check the circuit terminals for fretting or incorrectly seated connector if a DTC with symptom byte 04 or 0D is set. DTCs of deployment loops which are in the seat can occur because of stress or damage to the harness due to seat movement. Move the seat to the full extend of travel while using the scan tool to observe deployment type loop parameters.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*
- *Connector Repairs on page 11-895*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-38125-580 Terminal Release Tool Kit

Circuit/System Verification

Note:

- Refer to *SIR Service Precautions on page 12-152*.
- Inspect all terminals for damage or corrosion when disconnecting connectors. Damage or corrosion in the following requires repair or replacement of the affected component/connector.
  - Seat belt retractor pretensioner
  - Passenger instrument panel air bag
  - Knee air bag
  - Seat side air bag
  - Roof rail air bag
  - Inflatable restraint sensing and diagnostic module
  - Seat belt retractor pretensioner wiring harness connector
  - Passenger instrument panel air bag wiring harness connector
  - Seat side air bag wiring harness connector
  - Roof rail air bag wiring harness connector
  - Inflatable restraint sensing and diagnostic module wiring harness connector
- The connector and connector position assurance (CPA) may seat independent of each other. Both the connector and CPA should seat with an

audible and/or tactile click. The CPA isolates the shorting-bars within the connector allowing the deployment circuit to operate properly.

- If the condition is intermittent or cannot be duplicated, disconnect the connectors and add dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087). This procedure will correct the high resistance condition due to terminal fretting corrosion.

1. Verify the scan tool Deployment Loop Resistance parameters stay consistently between 2.1 and 4.0 Ω without any spikes or dropouts while moving the harness near each connector listed below:
   - F112 Seat belt retractor pretensioner
   - F113 Seat belt anchor pretensioner
   - Any inline harness
   - K36 inflatable restraint sensing and diagnostic module

⇒ **If less than 2.1 or greater than 4.0 Ω**

Refer to Circuit/System Testing.

⇒ **If there are spikes or dropouts, perform the following**

- Inspect each connector terminal and harness for damage or corrosion and repair as necessary
- Apply dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087) to each connector terminal
- Insure each connector and CPA is correctly seated.

⇓ **If within 2.1 and 4.0 Ω without any spikes or dropouts**

2. All OK

Circuit/System Testing

1. Vehicle OFF.
2. Disconnect the scan tool.
3. Disconnect the appropriate harness connector listed below:
   - F112 Seat belt retractor pretensioner
   - F113 Seat belt anchor pretensioner
4. Wait for 120 seconds.
5. Test for greater than 25 Ω between the appropriate control circuit terminals 1 and 2.

⇒ **If 25 Ω or less**

5.1. Disconnect the X2 harness connector at the K36 inflatable restraint sensing and diagnostic module.

Note: Some connectors may be equipped with shorting bars as a safety component to prevent accidental inflator deployment. When testing on a connector with shorting bars, the shorting bars must be disabled to ensure accurate test results. Insert an appropriate pick from EL-38125-580 and depress the shorting bars above the appropriate terminals. This will lift the shorting bar from the terminal and allow accurate test results. Take care not to damage the connector, shorting bar, or terminal when depressing the shorting bar.

5.2. Test for infinite resistance between the two control circuits.

⇒ If less than infinite resistance, repair the short between the two circuits.

⇒ If infinite resistance, replace the K36 inflatable restraint sensing and diagnostic module.

⇓ **If greater than 25 Ω**

6. Vehicle in Service Mode.
7. Test for less than 11 V between the control circuit terminals listed below and ground:
   - Control circuit terminal 1
   - Control circuit terminal 2

⇒ **If 11 V or greater**

7.1. Vehicle OFF.

7.2. Disconnect the X2 harness connector at the K36 inflatable restraint sensing and diagnostic module.

7.3. Vehicle in Service Mode.

7.4. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K36 inflatable restraint sensing and diagnostic module.

⇓ **If less than 11 V**

8. Vehicle OFF.
9. Test for greater than 25 Ω between the control circuit terminals listed below and ground:
   - Control circuit terminal 1
   - Control circuit terminal 2

⇒ **If 25 Ω or less**

9.1. Disconnect the X2 harness connector at the K36 inflatable restraint sensing and diagnostic module.

9.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K36 inflatable restraint sensing and diagnostic module.

⇓ **If greater than 25 Ω**

10. Vehicle OFF.
11. Install a 3 A fused jumper wire between the appropriate control circuit terminals 1 and 2.
12. Vehicle in Service Mode.

13. Verify the scan tool Deployment Loop Resistance parameter is less than 2 Ω.

⇒ **If 2 Ω or greater**

13.1. Vehicle OFF.

13.2. Disconnect the X2 harness connector at the K36 inflatable restraint sensing and diagnostic module.

13.3. Test for less than 2 Ω in each control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 inflatable restraint sensing and diagnostic module.

⇓ **If less than 2 Ω**

14. Vehicle OFF, connect the harness connector at the F112 seat belt retractor pretensioner or F113 seat belt anchor pretensioner, press in the CPA (if equipped) until an audible and/or tactile click is heard.
15. Vehicle in Service Mode, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.
16. Verify DTC B0015, B001A, B001B, or B0022 is not set.

⇒ **If B0015, B001A, B001B, or B0022 is set**

Replace the appropriate F112 seat belt retractor pretensioner or F113 seat belt anchor pretensioner.

⇓ **If DTC B0015, B001A, B001B, or B0022 is not set**

17. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Front Seat Belt Anchor Plate Tensioner Replacement on page 12-170*
- *Driver or Passenger Seat Retractor Side Belt Replacement on page 12-171*
- *SIR/SRS Wiring Repairs on page 11-894*
- *Control Module References on page 6-3* for inflatable restraint sensing and diagnostic module control module replacement, programming and setup

DTC B0016, B0018, B0023, or B0025

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0016 01: Left Roof Rail Air Bag Deployment Loop Short to Battery
DTC B0016 02: Left Roof Rail Air Bag Deployment Loop Short to Ground
DTC B0016 04: Left Roof Rail Air Bag Deployment Loop Open
DTC B0016 0D: Left Roof Rail Air Bag Deployment Loop High Resistance
DTC B0016 0E: Left Roof Rail Air Bag Deployment Loop Low Resistance
DTC B0023 01: Right Roof Rail Air Bag Deployment Loop Short to Battery
DTC B0023 02: Right Roof Rail Air Bag Deployment Loop Short to Ground
DTC B0023 04: Right Roof Rail Air Bag Deployment Loop Open
DTC B0023 0D: Right Roof Rail Air Bag Deployment Loop High Resistance
DTC B0023 0E: Right Roof Rail Air Bag Deployment Loop Low Resistance

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Left Roof Rail Air Bag High Control	B0016 02, B0016 0E	B0016 0D	B0016 04, B0016 0D	B0016 01	—
Left Roof Rail Air Bag Low Control	B0016 02, B0016 0E	B0016 0D	B0016 04, B0016 0D	B0016 01	—
Right Roof Rail Air Bag High Control	B0023 02, B0023 0E	B0023 0D	B0023 04, B0023 0D	B0023 01	—
Right Roof Rail Air Bag Low Control	B0023 02, B0023 0E	B0023 0D	B0023 04, B0023 0D	B0023 01	—

Circuit/System Description

During a side or frontal crash of sufficient force the inflatable restraint sensing and diagnostic module (SDM) will allow current to flow through the deployment loop in order to deploy an air bag or pretensioner. There are 2 shorting bars which will short together control circuits, when the connector is disconnected. This will help to prevent unwanted deployment of the air bag or pretensioner during servicing.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

B0016 01, B0023 01

The air bag control circuit is shorted to voltage for 2 seconds.

B0016 02, B0023 02

The air bag control circuit is shorted to ground for 2 seconds.

B0016 04, B0023 04

The air bag control circuit is open for 2 seconds.

B0016 0D, B0023 0D

The air bag deployment loop resistance is greater than 4.2 Ω for 2 seconds.

B0016 0E, B0023 0E

The air bag deployment loop resistance is less than 1.4 Ω for 2 seconds.

Action Taken When the DTC Sets

- The inflatable restraint sensing and diagnostic module requests the instrument cluster to illuminate the AIR BAG indicator.
- The inflatable restraint sensing and diagnostic module will store a DTC, however if an event occurs the system will still attempt deployments.

Conditions for Clearing the DTC

- The condition for setting the DTC no longer exists.
- A history DTC will clear once 100 malfunction-free ignition cycles have occurred.

Diagnostic Aid

Note: The following diagnostic aids apply for both current and history DTCs.

An incorrectly installed CPA or incorrectly seated connector can cause a shorting bar to short both control circuits together. Check the connectors and CPAs if a DTC with symptom byte 02 or 0E is set, to ensure the shorting bars are not causing the circuits to be shorted together. Shorting bars are used in the locations listed below:

- Passenger instrument panel air bag
- Driver and passenger seat side air bags
- Knee air bags
- Left and right roof rail air bags
- Driver and passenger retractor pretensioners
- Inline connectors – on the side of the harness connector
- Harness side of the inflatable restraint sensing and diagnostic module connector

Terminal fretting or incorrectly seated connectors can cause an open/high resistance condition. Check the circuit terminals for fretting or incorrectly seated connector if a DTC with symptom byte 04 or 0D is set. DTCs of deployment loops which are in the seat DTC can occur because of stress or damage to the harness due to seat movement. Move the seat to the full extend of travel while using the scan tool to observe deployment type loop parameters.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*
- *Connector Repairs on page 11-895*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-38125-580 Terminal Release Tool Kit

Circuit/System Verification

Note:

- Refer to *SIR Service Precautions on page 12-152*.
- Inspect all terminals for damage or corrosion when disconnecting connectors. Damage or corrosion in the following requires repair or replacement of the affected component/connector.
  - Seat belt retractor pretensioner
  - Passenger instrument panel air bag
  - Knee air bag
  - Seat side air bag
  - Roof rail air bag
  - Inflatable restraint sensing and diagnostic module
  - Seat belt retractor pretensioner wiring harness connector
  - Passenger instrument panel air bag wiring harness connector
  - Seat side air bag wiring harness connector
  - Roof rail air bag wiring harness connector
  - Inflatable restraint sensing and diagnostic module wiring harness connector
- The connector and connector position assurance (CPA) may seat independent of each other. Both the connector and CPA should seat with an audible and/or tactile click. The CPA isolates the shorting-bars within the connector allowing the deployment circuit to operate properly.
- If the condition is intermittent or cannot be duplicated, disconnect the connectors and add dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087). This procedure will correct the high resistance condition due to terminal fretting corrosion.

1. Verify the scan tool Deployment Loop Resistance parameters stay consistently between 2.1 and 4.0 Ω without any spikes or dropouts while moving the harness near each connector listed below:
   - F105L Roof rail air bag – left
   - F105R Roof rail air bag – right
   - Any inline harness
   - K36 inflatable restraint sensing and diagnostic module

⇒ **If less than 2.1 or greater than 4.0 Ω**

Refer to Circuit/System Testing.

⇒ **If there are spikes or dropouts, perform the following**

- Inspect each connector terminal and harness for damage or corrosion and repair as necessary
- Apply dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087) to each connector terminal
- Insure each connector and CPA is correctly seated.

⇓ **If within 2.1 and 4.0 Ω without any spikes or dropouts**

2. All OK

Circuit/System Testing

1. Vehicle OFF.
2. Disconnect the scan tool.
3. Disconnect the appropriate harness connector listed below:
   - F105L Roof Rail Air Bag – Left
   - F105R Roof Rail Air Bag – Right
4. Wait for 120 seconds.

5. Test for greater than 25 Ω between the control circuit terminals 1 and 2.

⇒ **If 25 Ω or less**

5.1. Disconnect the X2 harness connector at the K36 inflatable restraint sensing and diagnostic module.

Note: Some connectors may be equipped with shorting bars as a safety component to prevent accidental inflator deployment. When testing on a connector with shorting bars, the shorting bars must be disabled to ensure accurate test results. Insert an appropriate pick from EL-38125-580 and depress the shorting bars above the appropriate terminals. This will lift the shorting bar from the terminal and allow accurate test results. Take care not to damage the connector, shorting bar, or terminal when depressing the shorting bar.

5.2. Test for infinite resistance between the two control circuits.

⇒ If less than infinite resistance, repair the short between the two circuits.

⇒ If infinite resistance, replace the K36 inflatable restraint sensing and diagnostic module.

⇓ **If greater than 25 Ω**

6. Vehicle in Service Mode.
7. Test for less than 11 V between the control circuit terminals listed below and ground:
   - Control circuit terminal 1
   - Control circuit terminal 2

⇒ **If 11 V or greater**

7.1. Vehicle OFF.

7.2. Disconnect the X2 harness connector at the K36 inflatable restraint sensing and diagnostic module.

7.3. Vehicle in Service Mode.

7.4. Test for less than 1 V between each control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K36 inflatable restraint sensing and diagnostic module.

⇓ **If less than 11 V**

8. Vehicle OFF.
9. Test for greater than 25 Ω between the control circuit terminals listed below and ground:
   - Control circuit terminal 1
   - Control circuit terminal 2

⇒ **If 25 Ω or less**

9.1. Disconnect the X2 harness connector at the K36 inflatable restraint sensing and diagnostic module.

9.2. Test for infinite resistance between each control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K36 inflatable restraint sensing and diagnostic module.

⇓ **If greater than 25 Ω**

10. Vehicle OFF.
11. Install a 3 A fused jumper wire between the appropriate control circuit terminals 1 and 2.
12. Vehicle in Service Mode.
13. Verify the scan tool Deployment Loop Resistance parameter is less than 2 Ω.

⇒ **If 2 Ω or greater**

13.1. Vehicle OFF.

13.2. Disconnect the X2 harness connector at the K36 inflatable restraint sensing and diagnostic module.

13.3. Test for less than 2 Ω in each control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 inflatable restraint sensing and diagnostic module.

⇓ **If less than 2 Ω**

14. Vehicle OFF, connect the harness connector at the F105L Roof Rail Air Bag – left or F015R Roof Rail Air Bag – right, press in the CPA (if equipped) until an audible and/or tactile click is heard.
15. Vehicle in Service Mode, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.
16. Verify DTC B0016, B0018, B0023, or B0025 is not set.

⇒ **If DTC B0016, B0018, B0023, or B0025 is set**

Replace the appropriate F105L Roof Rail Air Bag – left or F015R Roof Rail Air Bag – right.

⇓ **If DTC B0016, B0018, B0023, or B0025 is not set**

17. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Front and Rear Row Seat Roof Rail Airbag Replacement on page 12-163*
- *Control Module References on page 6-3* for inflatable restraint sensing and diagnostic module control module replacement, programming and setup

DTC B0017 or B0024

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0017 01: Driver Knee Air Bag Deployment Loop Short to Battery
DTC B0017 02: Driver Knee Air Bag Deployment Loop Short to Ground
DTC B0017 04: Driver Knee Air Bag Deployment Loop Open
DTC B0017 0D: Driver Knee Air Bag Deployment Loop High Resistance
DTC B0017 0E: Driver Knee Air Bag Deployment Loop Low Resistance
DTC B0024 01: Passenger Knee Air Bag Deployment Loop Short to Battery
DTC B0024 02: Passenger Knee Air Bag Deployment Loop Short to Battery
DTC B0024 04: Passenger Knee Air Bag Deployment Loop Open
DTC B0024 0D: Passenger Knee Air Bag Deployment Loop High Resistance
DTC B0024 0E: Passenger Knee Air Bag Deployment Loop Low Resistance

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Driver Knee Air Bag High Control	B0017 02, B0017 0E	B0017 0D	B0017 04, B0017 0D	B0017 01	—
Driver Knee Air Bag Low Control	B0017 02, B0017 0E	B0017 0D	B0017 04, B0017 0D	B0017 01	—
Passenger Knee Air Bag High Control	B0024 02, B0024 0E	B0024 0D	B0024 04, B0024 0D	B0024 01	—
Passenger Knee Air Bag Low Control	B0024 02, B0024 0E	B0024 0D	B0024 04, B0024 0D	B0024 01	—

Circuit/System Description

During a side or frontal crash of sufficient force the inflatable restraint sensing and diagnostic module (SDM) will allow current to flow through the deployment loop in order to deploy an air bag. There are 2 shorting bars used within the connector that will short together the control circuits, when the connector is disconnected. This will help to prevent unwanted deployment of the air bag or retractor pretensioner during servicing.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

B0017 01, B0024 01

The air bag control circuit is shorted to voltage for 2 seconds.

B0017 02, B0024 02

The air bag control circuit is shorted to ground for 2 seconds.

B0017 04, B0024 04

The air bag control circuit is open for 2 seconds.

B0017 0D, B0024 0D

The air bag deployment loop resistance is greater than 4.2 Ω for 2 seconds.

B0017 0E, B0024 0E

The air bag deployment loop resistance is less than 1.4 Ω for 2 seconds.

Action Taken When the DTC Sets

- The Inflatable Restraint Sensing and Diagnostic Module requests the instrument cluster to illuminate the AIR BAG indicator.
- The Inflatable Restraint Sensing and Diagnostic Module will store a DTC, however if an event occurs the system will still attempt deployments.

Conditions for Clearing the DTC

- The condition for setting the DTC no longer exists.
- A history DTC will clear once 100 malfunction-free ignition cycles have occurred.

Diagnostic Aid

Note: The following diagnostic aids apply for both current and history DTCs.

An incorrectly installed CPA or incorrectly seated connector can cause a shorting bar to short both control circuits together. Check the connectors and CPAs if a DTC with symptom byte 02 or 0E is set, to ensure the shorting bars are not causing the circuits to be shorted together. Shorting bars are used in the locations listed below:

- Driver and passenger Knee Air Bags
- Inline connectors - on the side of the harness connector
- Harness side of the inflatable restraint sensing and diagnostic module connector

Terminal fretting or incorrectly seated connector can cause an open/high resistance condition. Check the circuit terminals for fretting or incorrectly seated connector if a DTC with symptom byte 04 or 0D is set. DTCs of deployment loops which are in the seat can occur because of stress or damage to the harness due to seat movement. Move the seat to the full extend of travel while using the scan tool to observe deployment type loop parameters.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*
- *Connector Repairs on page 11-895*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-38125-580 Terminal Release Tool Kit

Circuit/System Verification

Note:

- Refer to *SIR Service Precautions on page 12-152*.
- Inspect all terminals for damage or corrosion when disconnecting connectors. Damage or corrosion in the following requires repair or replacement of the affected component/connector.
  - Knee Air Bag
  - Inflatable Restraint Sensing and Diagnostic Module
  - Knee Air Bag wiring harness connector
  - Inflatable Restraint Sensing and Diagnostic Module wiring harness connector
- The connector and connector position assurance (CPA) may seat independent of each other. Both the connector and CPA should seat with an audible and/or tactile click. The CPA isolates the shorting-bars within the connector allowing the deployment circuit to operate properly.
- If the condition is intermittent or cannot be duplicated, disconnect the connectors and add dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087). This procedure will correct the high resistance condition due to terminal fretting corrosion.

1. Verify the scan tool Deployment Loop Resistance parameters stay consistently between 2.1 and 4.0 Ω without any spikes or dropouts while moving the harness near each connector listed below:
   - F114D Knee Air Bag - Driver
   - F114P Knee Air Bag - Passenger
   - Any inline harness
   - K36 Inflatable Restraint Sensing and Diagnostic Module

⇒ **If less than 2.1 or greater than 4.0 Ω**

Refer to Circuit/System Testing.

⇒ **If there are spikes or dropouts, perform the following**

- Inspect each connector terminal and harness for damage or corrosion and repair as necessary
- Apply dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087) to each connector terminal
- Insure each connector and CPA is correctly seated.

⇓ **If within 2.1 and 4.0 Ω without any spikes or dropouts**

2. All OK

Circuit/System Testing

1. Vehicle OFF, disconnect the scan tool, disconnect the appropriate F114 Knee Air Bag harness connector, and then wait for 120 seconds.
2. Test for greater than 25 Ω between the appropriate control circuit terminals 1 and 2.

⇒ **If 25 Ω or less**

2.1. Disconnect the X1 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

Note: Some connectors may be equipped with shorting bars as a safety component to prevent accidental inflator deployment. When testing on a connector with shorting bars, the shorting bars must be disabled to ensure accurate test results. Insert an appropriate pick from EL-38125-580 and depress the shorting bars above the appropriate terminals. This will lift the shorting bar from the terminal and allow accurate test results.

Take care not to damage the connector, shorting bar, or terminal when depressing the shorting bar.

2.2. Test for infinite resistance between the two control circuits.

⇒ If less than infinite resistance, repair the short between the two circuits.

⇒ If infinite resistance, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If greater than 25 Ω**

3. Vehicle in Service Mode.
4. Test for less than 11 V between the control circuit terminals listed below and ground:
   - Control circuit terminal 1
   - Control circuit terminal 2

⇒ **If 11 V or greater**

4.1. Vehicle OFF, disconnect the X1 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module, Vehicle in Service Mode.

4.2. Test for less than 1 V between each control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 11 V**

5. Vehicle OFF.
6. Test for greater than 25 Ω between the control circuit terminals listed below and ground:
   - Control circuit terminal 1
   - Control circuit terminal 2

⇒ **If 25 Ω or less**

6.1. Disconnect the X1 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

6.2. Test for infinite resistance between each control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If greater than 25 Ω**

7. Vehicle OFF, install a 3 A fused jumper wire between the control circuit terminals 1 and 2.
8. Verify the scan tool Deployment Loop Resistance parameter is less than 2 Ω.

⇒ **If 2 Ω or greater**

8.1. Vehicle OFF, disconnect the X1 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

8.2. Test for less than 2 Ω in each control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 2 Ω**

9. Vehicle OFF, connect the harness connector at the F114 knee air bag, press in the CPA (if equipped) until an audible and/or tactile click is heard.
10. Vehicle in Service Mode, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.
11. Verify DTC B0017 or B0024 is not set.

⇒ **If DTC B0017 or B0024 is set**

Replace the appropriate F114 Knee Air Bag.

⇓ **If DTC B0017 or B0024 is not set**

12. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Instrument Panel Lower Airbag Replacement - Driver Side on page 12-160*
- *Instrument Panel Lower Airbag Replacement - Passenger Side on page 12-161*
- *Control Module References on page 6-3* for inflatable restraint sensing and diagnostic module control module replacement, programming and setup

DTC B0019 or B0020

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0019 01: Passenger Instrument Panel Air Bag Deployment Loop Stage 1 Short to Battery
DTC B0019 02: Passenger Instrument Panel Air Bag Deployment Loop Stage 1 Short to Ground
DTC B0019 04: Passenger Instrument Panel Air Bag Deployment Loop Stage 1 Open
DTC B0019 0D: Passenger Instrument Panel Air Bag Deployment Loop Stage 1 High Resistance
DTC B0019 0E: Passenger Instrument Panel Air Bag Deployment Loop Stage 1 Low Resistance
DTC B0020 01: Passenger Instrument Panel Air Bag Deployment Loop Stage 2 Short to Battery
DTC B0020 02: Passenger Instrument Panel Air Bag Deployment Loop Stage 2 Short to Ground
DTC B0020 04: Passenger Instrument Panel Air Bag Deployment Loop Stage 2 Open
DTC B0020 0D: Passenger Instrument Panel Air Bag Deployment Loop Stage 2 High Resistance
DTC B0020 0E: Passenger Instrument Panel Air Bag Deployment Loop Stage 2 Low Resistance

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Passenger Instrument Panel Air Bag Stage 1 High Control	B0019 02, B0019 0E	B0019 0D	B0019 04, B0019 0D	B0019 01	—
Passenger Instrument Panel Air Bag Stage 1 Low Control	B0019 02, B0019 0E	B0019 0D	B0019 04, B0019 0D	B0019 01	—
Passenger Instrument Panel Air Bag Stage 2 High Control	B0020 02, B0020 0E	B0020 0D	B0020 04, B0020 0D	B0020 01	—
Passenger Instrument Panel Air Bag Stage 2 Low Control	B0020 02, B0020 0E	B0020 0D	B0020 04, B0020 0D	B0020 01	—

Circuit/System Description

During a side or frontal crash of sufficient force the inflatable restraint sensing and diagnostic module (SDM) will allow current to flow through the deployment loop in order to deploy an air bag or pretensioner. There are 2 shorting bars which will short together control circuits, when the connector is disconnected. This will help to prevent unwanted deployment of the air bag or pretensioner during servicing.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

B0019 01, B0020 01

The air bag control circuit is shorted to voltage for 2 seconds.

B0019 02, B0020 02

The air bag control circuit is shorted to ground for 2 seconds.

B0019 04, B0020 04

The air bag control circuit is open for 2 seconds.

B0019 0D, B0020 0D

The air bag deployment loop resistance is greater than 4.2 Ω for 2 seconds.

B0019 0E, B0020 0E

The air bag deployment loop resistance is less than 1.4 Ω for 2 seconds.

Action Taken When the DTC Sets

- The inflatable restraint sensing and diagnostic module requests the instrument cluster to illuminate the AIR BAG indicator.
- The inflatable restraint sensing and diagnostic module will store a DTC, however if an event occurs the system will still attempt deployments.

Conditions for Clearing the DTC

- The condition for setting the DTC no longer exists.
- A history DTC will clear once 100 malfunction-free ignition cycles have occurred.

Diagnostic Aid

Note: The following diagnostic aids apply for both current and history DTCs.

An incorrectly installed connector position assurance (CPA) or incorrectly seated connector can cause a shorting bar to short both control circuits together. Check the connectors and CPAs if a DTC with symptom byte 02 or 0E is set, to ensure the shorting bars are not causing the circuits to be shorted together. Shorting bars are used in the locations listed below:

- Passenger instrument panel air bag
- Inline harness connectors
- Harness side of the inflatable restraint sensing and diagnostic module connector

Terminal fretting or incorrectly seated connectors can cause an open/high resistance condition. Check the circuit terminals for fretting or incorrectly seated connector if a DTC with symptom byte 04 or 0D is set. DTCs of deployment loops which are in the seat can occur because of stress or damage to the harness due to seat movement. Move the seat to the full extent of travel while using the scan tool to observe deployment type loop parameters.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*
- *Connector Repairs on page 11-895*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-38125-580 Terminal Release Tool Kit

Circuit/System Verification

Note:

- Refer to *SIR Service Precautions on page 12-152*.
- Inspect all terminals for damage or corrosion when disconnecting connectors. Damage or corrosion in the following requires repair or replacement of the affected component/connector:
  - Passenger instrument panel air bag
  - Inflatable restraint sensing and diagnostic module
  - Passenger instrument panel air bag wiring harness connector
  - Inflatable restraint sensing and diagnostic module wiring harness connector
- The connector and connector position assurance (CPA) may seat independent of each other. Both the connector and CPA should seat with an audible and/or tactile click. The CPA isolates the shorting-bars within the connector allowing the deployment circuit to operate properly.
- If the condition is intermittent or cannot be duplicated, disconnect the connectors and add dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087). This procedure will correct the high resistance condition due to terminal fretting corrosion.

1. Verify the scan tool Deployment Loop Resistance parameters stay consistently between 2.1 and 4.0 Ω without any spikes or dropouts while moving the harness near each connector listed below:
   - F105 Passenger instrument panel air bag
   - Any inline harness connector
   - K36 inflatable restraint sensing and diagnostic module

⇒ **If less than 2.1 or greater than 4.0 Ω**

Refer to Circuit/System Testing.

⇒ **If there are spikes or dropouts, perform the following:**

- Inspect each connector terminal and harness for damage or corrosion and repair as necessary.
- Apply dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087) to each connector terminal.
- Ensure each connector and CPA is correctly seated.

⇓ **If within 2.1 and 4.0 Ω without any spikes or dropouts**

2. All OK

Circuit/System Testing

1. Vehicle OFF. Disconnect the scan tool. Disconnect the inline harness connector X235.
2. Test for greater than 25 Ω between the appropriate control circuit terminals listed below on the inflatable restraint sensing and diagnostic module side of the connector:
   - F105 Passenger instrument panel air bag stage 1 X235 terminal 1 and 2
   - F105 Passenger instrument panel air bag stage 2 X235 terminal 3 and 4

⇒ **If 25 Ω or less**

2.1. Disconnect the X1 harness connector at the K36 inflatable restraint sensing and diagnostic module.

Note: Some connectors may be equipped with shorting bars as a safety component to prevent accidental inflator deployment. When testing on a connector with shorting bars, the shorting bars must be disabled to ensure accurate test results. Insert an appropriate pick from EL-38125-580 and depress the shorting bars above the appropriate terminals. This will lift the shorting bar from

the terminal and allow accurate test results. Take care not to damage the connector, shorting bar, or terminal when depressing the shorting bar.

2.2. Test for infinite resistance between the 2 control circuits.

⇒ If less than infinite resistance, repair the short between the 2 circuits.

⇒ If infinite resistance, replace the K36 inflatable restraint sensing and diagnostic module.

⇓ **If greater than 25 Ω**

3. Vehicle in Service Mode.
4. Test for less than 11 V between the control circuit terminals listed below and ground:
   - X235 control circuit terminal 1
   - X235 control circuit terminal 2
   - X235 control circuit terminal 3
   - X235 control circuit terminal 4

⇒ **If 11 V or greater**

4.1. Vehicle OFF. Disconnect the X1 harness connector at the K36 inflatable restraint sensing and diagnostic module. Vehicle in Service Mode.

4.2. Test for less than 1 V between each control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K36 inflatable restraint sensing and diagnostic module.

⇓ **If less than 11 V**

5. Vehicle OFF. Test for greater than 25 Ω between the control circuit terminals listed below and ground:
   - X235 control circuit terminal 1
   - X235 control circuit terminal 2
   - X235 control circuit terminal 3
   - X235 control circuit terminal 4

⇒ **If 25 Ω or less**

5.1. Disconnect the X1 harness connector at the K36 inflatable restraint sensing and diagnostic module.

5.2. Test for infinite resistance between each control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K36 inflatable restraint sensing and diagnostic module.

⇓ **If greater than 25 Ω**

6. Install a 3 A fused jumper wire between the control circuit terminals listed below:
   - F101 Passenger Instrument Panel Air Bag stage 1 X235 terminal 1 and 2
   - F101 Passenger Instrument Panel Air Bag stage 2 X235 terminal 3 and 4
7. Vehicle in Service Mode.
8. Verify the scan tool Deployment Loop Resistance parameter is less than 2 Ω.

⇒ **If 2 Ω or greater**

8.1. Vehicle OFF. Disconnect the X1 harness connector at the K36 inflatable restraint sensing and diagnostic module.

8.2. Test for less than 2 Ω in each control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 inflatable restraint sensing and diagnostic module.

⇓ **If less than 2 Ω**

9. Vehicle OFF. Reconnect X1 harness connector X235. Disconnect the F101 Passenger instrument panel air bag harness connector X1 and X2. Vehicle in Service Mode.
10. Test for less than 11 V between the control circuit terminals listed below and ground:
    - Terminal 1 X1
    - Terminal 2 X1
    - Terminal 1 X2
    - Terminal 2 X2

⇒ **If 11 V or greater**

Repair the short to voltage on the circuit.

⇓ **If less than 11 V**

11. Vehicle OFF.
12. Test for greater than 25 Ω between the control circuit terminals listed below and ground:
    - Terminal 1 X1
    - Terminal 2 X1
    - Terminal 1 X2
    - Terminal 2 X2

⇒ **If 25 Ω or less**

Repair the short to ground on the circuit.

⇓ **If greater than 25 Ω**

13. Install a 3 A fused jumper wire between the control circuit terminals listed below:
    - F101 Passenger Instrument Panel Air Bag stage 1 X1 terminal 1 and 2
    - F101 Passenger Instrument Panel Air Bag stage 2 X2 terminal 1 and 2
14. Vehicle in Service Mode.
15. Verify the scan tool Deployment Loop Resistance parameter is less than 2 Ω.

⇒ **If greater than 2 Ω**

Repair the open/high resistance in the circuit between the F101 Passenger Instrument Panel Air Bag connector and the X235 inline harness connector.

⇓ **If less than 2 Ω**

16. Vehicle OFF, connect the harness connector at the F101 Passenger Instrument Panel Air Bag, press in the CPA (if equipped) until an audible and/or tactile click is heard.

17. Vehicle in Service Mode, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.
18. Verify DTC B0019 or B0020 is not set.

⇒ **If DTC B0019 or B0020 is set**

Replace the F101 Passenger Instrument Panel Air Bag.

⇓ **If DTC B0019 or B0020 is not set**

19. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Instrument Panel Airbag Replacement on page 12-159*
- *Control Module References on page 6-3* for inflatable restraint sensing and diagnostic module replacement, programming, and setup

DTC B0052

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using the diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0052 00: Deployment Commanded

DTC B0052 56: Deployment Commanded Too Many Transitions

Circuit/System Description

The inflatable restraint sensing and diagnostic module (SDM) senses vehicle impacts and provides deployment signals to the air bags and anchor and/or retractor pretensioners when warranted. The inflatable restraint sensing and diagnostic module sets DTC B0052 after each command for deployment. DTC B0052 will latch and not clear after 3 commanded deployments by the inflatable restraint sensing and diagnostic module. Therefore the inflatable restraint sensing and diagnostic module has to be replaced.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

- The inflatable restraint sensing and diagnostic module detects a frontal impact of sufficient force to warrant deployment of the frontal air bags.
- The inflatable restraint sensing and diagnostic module detects a side impact or rollover (if equipped) of sufficient force to warrant deployment of a seat air bag and/or roof rail air bag.

Action Taken When the DTC Sets

The inflatable restraint sensing and diagnostic module requests the instrument cluster to illuminate the AIR BAG indicator.

Conditions for Clearing the DTC

- DTC B0052 00 is a DTC that may be cleared with a scan tool without replacing the inflatable restraint sensing and diagnostic module. This DTC will not clear if deployment has been commanded more then two times, and the inflatable restraint sensing and diagnostic module would have to be replaced.
- DTC B0052 56 is a latched DTC. The DTC cannot be cleared with the scan tool. Replacement of the inflatable restraint sensing and diagnostic module is required.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*
- *Connector Repairs on page 11-895*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify that DTC B0052 00 is not set.

⇒ **If DTC B0052 00 is set**

Clear the DTC. If the DTC will not clear, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If DTC B0052 00 is not set**

2. Verify that DTC B0052 56 is not set.

⇒ **If DTC B0052 56 is set**

Replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If DTC B0052 56 is not set**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for inflatable restraint sensing and diagnostic module replacement, programming and setup

DTC B0071

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0071 03: Passenger Seat Belt Tension Sensor Circuit Voltage Below Threshold
DTC B0071 04: Passenger Seat Belt Tension Sensor Circuit Open
DTC B0071 07: Passenger Seat Belt Tension Sensor Circuit Voltage Above Threshold
DTC B0071 08: Passenger Seat Belt Tension Sensor Circuit Voltage Performance – Signal Invalid

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Passenger Seat Belt Tension Sensor Signal	B0071 03	B0071 04	B0071 07	B0071 08
Passenger Seat Belt Tension Sensor Voltage Reference	B0071 03	B0071 03	—	—
Passenger Seat Belt Tension Sensor Ground	—	B0071 07	—	—

Circuit/System Description

The seat belt tension sensor is a 3-wire sensor mounted in the passenger seat belt buckle and provides an input to the passenger presence module. When an infant car seat is properly restrained on the front passenger seat, the seat belt is tightly secured through the car seat. The seat belt pulls on the tension sensor and changes the voltage signal to the passenger presence module. The passenger presence module monitors the belt tension sensor signal circuit and if a fault is detected, DTC will be set. When the passenger presence module detects this DTC it will send out a serial data message and the inflatable restraint sensing and diagnostic module will notify the customer of the enable/disable status by illuminating the OFF indicator on the PASSENGER AIR BAG ON/OFF indicators. The inflatable restraint sensing and diagnostic module will then suppress the deployment of the passenger instrument panel air bag and illuminate the AIR BAG indicator.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

- The passenger presence module detects the voltage at the passenger seat belt tension sensor signal circuit is less than 0.5 volt or greater than 4.5 V for 1 s.
- The passenger presence module detects the voltage at the passenger seat belt tension sensor voltage reference circuit is less than 4.5 V or greater than 9.1 V for 1 s.
- The passenger presence module detects the amperage at the passenger seat belt tension sensor low reference circuit is 25 mA or greater for 1 s.

Action Taken When the DTC Sets

- The passenger presence module will set a DTC, and then communicate with the inflatable restraint sensing and diagnostic module.
- The inflatable restraint sensing and diagnostic module will set DTC B0081
- The inflatable restraint sensing and diagnostic module disables the passenger instrument panel air bag.
- The passenger presence module will illuminate the passenger air bag status OFF indicator.
- The inflatable restraint sensing and diagnostic module requests the instrument panel to illuminate the AIR BAG indicator.

Conditions for Clearing the DTC

- The condition for setting the DTC no longer exists.
- A history DTC will clear once 100 malfunction-free ignition cycles have occurred.

Diagnostic Aids

Inspect the passenger seat belt tension sensor signal, voltage reference, and low reference circuits carefully for cutting and/or chafing.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

Note: The seat belt buckle replacement with the seat belt tension sensor must be serviced as a complete unit.

When removing connectors, inspect for damage or corrosion. Damage or corrosion in the following requires repair or replacement of the affected component/connector:

- Passenger seat belt tension sensor
- Passenger presence module
- Passenger seat belt tension sensor wiring harness connector
- Passenger presence module wiring harness connector

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the B153P Seat Belt Buckle – Passenger. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.

⇒ **If greater than 10 Ω**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode.
4. Test for less than 6 V between the passenger seat belt tension sensor signal circuit terminal 5 and ground.

⇒ **If 6 V or greater**

4.1. Vehicle OFF, disconnect the harness connector at the K85 Passenger Presence Module, vehicle in Service Mode.

4.2. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K85 Passenger Presence Module.

⇓ **If less than 6 V**

5. Vehicle OFF, test for greater than 5K Ω between the passenger seat belt tension sensor signal circuit terminal 3 and ground. It may take up to 2 minutes for all vehicle systems to power down.

⇒ **If less than 5K Ω**

5.1. Disconnect the harness connector at the K85 Passenger Presence Module.

5.2. Test for Infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K85 Passenger Presence Module.

⇓ **If greater than 5K Ω**

6. Disconnect the harness connector at the K85 Passenger Presence Module.
7. Test for less than 2 Ω between the B153P Seat Belt Buckle – Passenger signal circuit terminal 3 and the K85 Passenger Presence Module signal circuit terminal 6.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

⇓ **If less than 2 Ω**

8. If all circuits test normal, replace the B153P Seat Belt Buckle – Passenger.
9. Vehicle in Service Mode, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.
10. Verify DTC B0071 does not set.

⇒ **If DTC B0071 is set**

Replace the K85 Passenger Presence Module.

⇓ **If DTC B0071 is not set**

11. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *SIR/SRS Wiring Repairs on page 11-894*
- *Front Seat Belt Buckle Replacement on page 12-94* for B61P Seat Belt Tension Sensor - Passenger replacement
- *Control Module References on page 6-3* for passenger presence module replacement, setup, and programming

DTC B0074

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0074 00: Passenger Presence Sensor Circuit Malfunction
DTC B0074 0D: Passenger Presence Sensor Resistance Above Threshold
DTC B0074 0E: Passenger Presence Sensor Resistance Below Threshold
DTC B0074 0F: Passenger Presence Sensor Erratic (Wet Seat)

Circuit/System Description

The passenger presence module monitors the sensor status continually. Whenever the sensor mat has an internal malfunction, the passenger presence module will set DTC B0074.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

B0074 00

The passenger presence module has detected a disconnection from the sensor mat.

B0074 0D

The passenger presence module has detected a resistance above threshold.

B0074 0E

The passenger presence module has detected a resistance below threshold.

B0074 0F

The passenger presence module has detected a wet seat fault.

Action Taken When the DTC Sets

The inflatable restraint sensing and diagnostic module requests the instrument panel cluster to illuminate the AIR BAG indicator.

Conditions for Clearing the DTC

- The condition for setting the DTC no longer exists.
- A history DTC will clear once 100 malfunction-free ignition cycles have occurred.

Diagnostic Aids

- If either the inflatable restraint sensing and diagnostic module or passenger presence module were replaced verify that the correct part numbers were used for the vehicle application.
- If this DTC is set as either current or history it may have been caused by an electronic device. If an electronic device (computers, MP3 players, cell phones, diagnostic scan tool, power inverter, etc.) was placed on the passenger seat the passenger presence module may command the passenger air bag indicator to turn on and/or command the passenger seat belt indicator to turn on. Make sure there are no objects on the passenger seat and clear the DTCs. If this DTC resets then perform this diagnostic. If the DTC does not reset there is no further work needed on the passenger presence system.
- If this DTC is set as either current or history it may have been caused by an aftermarket seat heater. The aftermarket seat heater may command the passenger air bag indicator to turn on and/or command the passenger seat belt indicator to turn on. Remove the aftermarket seat heater from the passenger seat and clear the DTCs. If this DTC resets then perform this diagnostic. If the DTC does not reset there is no further work needed on the passenger presence system.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Connector Repairs on page 11-895*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note: This system is serviced as a kit (seat foam, module and/or sensing mat). Perform a Passenger Presence System Preload whenever a component is replaced, refer to *Passenger Presence System Programming and Setup on page 6-15*. Inspect component connectors for damage or corrosion. Repair or replace the affected component/connector:

- Passenger presence module
- Passenger presence module harness connector
- Seat wiring harness to vehicle harness connector

The connector and connector position assurance (CPA) may seat independent of each other. Both the connector and CPA should seat with an audible and/or tactile click.

1. Verify the DTC remains current while moving the passenger seat forward and backward through it's full range of motion.

⇒ **If the DTC changes to History**

If the status changes this could be indication of a seat to vehicle harness connection issue, refer to Circuit/System Testing.

⇓ **If the DTC remains Current**

2. Verify with the scan tool, the fault does not change status while moving the harness near each connector listed below.
   - K85 Passenger Presence Module
   - B60 Passenger Presence Sensor
   - Any seat harness inline

   ⇒ **If the status changes**

   If the reading is erratic while moving the harness, perform the following:
   - Inspect each connector terminal for damage or corrosion and repair as necessary.
   - Ensure each connector and CPA is correctly seated.

   ⇓ **If the status does not change**
3. All OK.

Circuit/System Testing

Note: This system is serviced as a kit (seat foam, module and/or sensing mat). Perform a Passenger Presence System Preload whenever a component is replaced, refer to *Passenger Presence System Programming and Setup on page 6-15*. Inspect component connectors for damage or corrosion. Repair or replace the affected component/connector:

1. Confirm that all passenger presence system connectors are fully seated.
2. Verify that DTC B0074 0F is not set.

⇒ **DTC B0074 0F is set.**

Note: Verify there are no electronic devices on the passenger seat. If not, then verify the seat is dry by removing the trim from the seat bottom frame. If the seat is wet, allow 24-48 hours dry time with trim completely off. If the DTC is history, do not replace B60 Passenger Presence Sensor. Clear passenger presence module DTCs.

2.1. Verify there are no electronic devices on the passenger seat.

⇒ Empty the passenger seat

⇓ If the seat is empty

2.2. Verify the seat is dry by removing the trim from the seat bottom frame.

⇒ If the seat is wet, allow 24-48 hours dry time with trim completely off.

⇓ If the seat is dry

2.3. If the DTC is history, do not replace B60 Passenger Presence Sensor, and clear passenger presence module DTCs.

⇓ **DTC B0074 0F does not set.**

3. Verify DTC B0074 00, B0074 0D or B0074 0E is not set.

⇒ **DTC B0074 00, B0074 0D or B0074 0E is set.**

Replace the K85 Passenger Presence Module.

⇓ **DTC B0074 00, B0074 0D or B0074 0E do not set.**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for passenger presence module replacement, programming and setup

DTC B0081

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using the diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0081 00: Passenger Presence Module Erratic (sets in the Inflatable Restraint Sensing and Diagnostic Module)

DTC B0081 3A: Passenger Presence Module Incorrect Component Installed (sets in the Inflatable Restraint Sensing and Diagnostic Module)

DTC B0081 71: Passenger Presence Module Invalid Serial Data Received (sets in Inflatable Restraint Sensing and Diagnostic Module)

DTC B0081 11: Passenger Presence Module High Input (sets in the Passenger Presence Module)

DTC B0081 4B: Passenger Presence Module Calibration Not Learned (sets in the Passenger Presence Module)

DTC B0081 5A: Passenger Presence Module Plausibility Failure (sets in Passenger Presence Module)

Circuit/System Description

When the ignition is turned ON, the Passenger Presence Module and the Inflatable Restraint Sensing and Diagnostic Module performs tests to diagnose critical malfunctions. When the Inflatable Restraint Sensing and Diagnostic Module has completed the power-up mode, the Inflatable Restraint Sensing and Diagnostic Module will establish communication with the Passenger Presence Module. The Inflatable Restraint Sensing and Diagnostic Module will also request the instrument panel cluster (IPC) to illuminate both of the PASSENGER AIR BAG ON/OFF indicators ON for 5 seconds. If the Inflatable Restraint Sensing and Diagnostic Module determines the correct Passenger Presence Module is installed and functioning normally, the Inflatable Restraint Sensing and Diagnostic Module will illuminate the passenger air bags ON or OFF indicator based on messages from the Passenger Presence Module. The Inflatable Restraint Sensing and Diagnostic Module sends a message to the IPC to illuminate the appropriate PASSENGER AIR BAG ON/OFF indicator.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

All of the following conditions must exist for 5 seconds:

B0081 00

The Inflatable Restraint Sensing and Diagnostic Module sets this DTC if there is a fault present in the Passenger Presence Module.

B0081 3A

The Inflatable Restraint Sensing and Diagnostic Module sets this DTC when the Inflatable Restraint Sensing and Diagnostic Module has received a message from the Passenger Presence Module which indicates a mismatch between the Inflatable Restraint Sensing and Diagnostic Module and Passenger Presence Module. There is either an incorrect Inflatable Restraint Sensing and Diagnostic Module or Passenger Presence Module installed on this vehicle.

B0081 71

The Inflatable Restraint Sensing and Diagnostic Module sets this DTC when the Inflatable Restraint Sensing and Diagnostic Module has received invalid serial data from the Passenger Presence Module.

B0081 11

The Passenger Presence Module sets this DTC when there is a high input to the Passenger Presence Module.

B0081 4B

The Passenger Presence Module sets this DTC when the Passenger Presence Module has not learned the calibrations.

B0081 5A

The Passenger Presence Module sets this code when the Passenger Presence Module has lost communications with the Inflatable Restraint Sensing and Diagnostic Module.

Action Taken When the DTC Sets

- The Inflatable Restraint Sensing and Diagnostic Module disables the passenger instrument panel air bag.
- The Passenger Presence Module will illuminate the Passenger Airbag On/Off indicator status as OFF.
- When the Passenger Presence Module sets this DTC, the Passenger Presence Module communicates with the Inflatable Restraint Sensing and Diagnostic Module to turn the AIRBAG indicator on.

- When the Inflatable Restraint Sensing and Diagnostic Module sets this DTC, the Inflatable Restraint Sensing and Diagnostic Module will turn the AIRBAG indicator on.
- The Inflatable Restraint Sensing and Diagnostic Module requests the instrument panel cluster (IPC) to illuminate the AIRBAG indicator.

Conditions for Clearing the DTC

- The condition for setting the DTC no longer exists and there is no activity on the low speed serial data circuits.
- A history DTC will clear once 100 malfunction-free ignition cycles have occurred.

Diagnostic Aids

- If either the Inflatable Restraint Sensing and Diagnostic Module or Passenger Presence Module were replaced verify that the correct part numbers were used for the vehicle application.
- If this DTC is set as either current or history it may have been caused by an electronic device. If an electronic device (Computers, MP3 Players, Cell Phones, Diagnostic Scan Tool, Power Inverter, etc.) was placed on the passenger seat the Passenger Presence Module may command the passenger air bag indicator to turn on and/or command the passenger seat belt indicator to turn on. Make sure there are no objects on the passenger seat and clear the DTCs. If this DTC resets then perform this diagnostic. If the DTC does not reset there is no further work needed on the passenger presence system.
- If this DTC is set as either current or history it may have been caused by an aftermarket seat heater. The aftermarket seat heater may command the passenger air bag indicator to turn on and/or command the passenger seat belt indicator to turn on. Remove the aftermarket seat heater from the passenger seat and clear the DTCs. If this DTC resets then perform this diagnostic. If the DTC does not reset there is no further work needed on the passenger presence system.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note:

- When removing connectors inspect for damage, corrosion or poor connection. Damage or corrosion in the following requires repair or replacement of the affected component/ connector.
- Passenger Presence Module
- Inflatable Restraint Sensing and Diagnostic Module
- Passenger Presence Module harness connector
- Inflatable Restraint Sensing and Diagnostic Module wiring harness connector

1. Vehicle in Service Mode.

   Verify that DTC B0081 is the only DTC set in the K36 Inflatable Restraint Sensing and Diagnostic Module or K85 Passenger Presence Module.

⇒ **If any other DTC is set**

Diagnose the other DTCs first, refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If B0081 is the only DTC set**

Note: The K36 Inflatable Restraint Sensing and Diagnostic Module sets a redundant B0081 00 DTC when the K85 Passenger Presence Module sets a DTC B0081 11, B0081 4B, or B0081 71.

2. Verify DTC B0081 11 or DTC B0081 4B is not set in the K85 Passenger Presence Module.

⇒ **If DTC B0081 11 or DTC B0081 4B is set in the K85 Passenger Presence Module**

The correct calibration was not learned by the K85 Passenger Presence Module. Perform the Passenger Presence System Preload Test procedure. Refer to *Passenger Presence System Programming and Setup on page 6-15*.

⇓ **If neither of these DTCs are set in the K85 Passenger Presence Module**

3. Verify DTC B0081 5A is not set in the K85 Passenger Presence Module.

⇒ **If DTC B0081 5A is set in the K85 Passenger Presence Module**

3.1. Check the connections at the K36 Inflatable Restraint Sensing and Diagnostic Module and K85 Passenger Presence Module.

3.2. Clear the DTC's and check if DTC B0081 5A sets again in the K85 Passenger Presence Module.

⇒ If DTC B0081 5A sets again replace the B60 Passenger Presence Sensor.

⇓ If DTC B0081 5A does not set

3.3. All OK.

⇓ **If none of these DTCs set in the K85 Passenger Presence Module**

4. Verify DTC B0081 3A is not set in the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇒ **If DTC B0081 3A is set in the K36 Inflatable Restraint Sensing and Diagnostic Module**

4.1. Either an incorrect replacement K85 Passenger Presence Module or K36 Inflatable Restraint Sensing and Diagnostic Module was placed in this vehicle. Check and make sure the part numbers are correct for each module.

⇒ If either part number is incorrect replace it with the correct part number.

⇓ If both part numbers are correct

4.2. Clear the DTC's and check if DTC B0081 3A sets again in the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇒ If DTC B0081 3A sets again replace the B60 passenger presence sensor. If the DTC sets again replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ If DTC B0081 3A does not set

4.3. All OK.

⇓ **If DTC B0081 3A is not set in the K36 Inflatable Restraint Sensing and Diagnostic Module**

5. Verify DTC B0081 71 is not set in the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇒ **If DTC B0081 71 is set in the K36 Inflatable Restraint Sensing and Diagnostic Module**

5.1. Check the connections at the K36 Inflatable Restraint Sensing and Diagnostic Module and K85 Passenger Presence Module.

5.2. Clear the DTC's and check if DTC B0081 71 sets again in the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇒ If DTC B0081 71 sets again replace the B60 passenger presence sensor.

⇓ If DTC B0081 71 does not set

5.3. All OK.

⇒ **If DTC B0081 71 does not set in the K36 Inflatable Restraint Sensing and Diagnostic Module**

6. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *SIR/SRS Wiring Repairs on page 11-894*
- *Control Module References on page 6-3* for passenger presence system or Inflatable Restraint Sensing and Diagnostic Module replacement, programming and setup

DTC B0083-B0088

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0083 01: Left Front Impact Sensor Short to Battery
DTC B0083 02: Left Front Impact Sensor Short to Ground
DTC B0083 04: Left Front Impact Sensor Open
DTC B0083 05: Left Front Impact Sensor High/Voltage Open
DTC B0083 0C: Left Front Impact Sensor Low Current
DTC B0083 39: Left Front Impact Sensor Internal Electronic Failure
DTC B0083 3A: Left Front Impact Sensor Incorrect Component Installed
DTC B0083 71: Left Front Impact Sensor Invalid Serial Data Received
DTC B0084 01: Right Front Impact Sensor Short to Battery
DTC B0084 02: Right Front Impact Sensor Short to Ground
DTC B0084 04: Right Front Impact Sensor Open
DTC B0084 05: Right Front Impact Sensor High/Voltage Open
DTC B0084 0C: Right Front Impact Sensor Low Current
DTC B0084 39: Right Front Impact Sensor Internal Electronic Failure
DTC B0084 3A: Right Front Impact Sensor Incorrect Component Installed
DTC B0084 71: Right Front Impact Sensor Invalid Serial Data Received
DTC B0085 01: Left Front Side Impact Sensor Short to Battery
DTC B0085 02: Left Front Side Impact Sensor Short to Ground
DTC B0085 04: Left Front Side Impact Sensor Open
DTC B0085 05: Left Front Side Impact Sensor High/Voltage Open
DTC B0085 0C: Left Front Side Impact Sensor Low Current
DTC B0085 39: Left Front Side Impact Sensor Internal Malfunction
DTC B0085 3A: Left Front Side Impact Sensor Incorrect Component Installed
DTC B0085 71: Left Front Side Impact Sensor Invalid Serial Data Received
DTC B0086 01: Right Front Side Impact Sensor Short to Battery
DTC B0086 02: Right Front Side Impact Sensor Short to Ground
DTC B0086 04: Right Front Side Impact Sensor Open
DTC B0086 05: Right Front Side Impact Sensor High/Voltage Open
DTC B0086 0C: Right Front Side Impact Sensor Low Current
DTC B0086 39: Right Front Side Impact Sensor Internal Malfunction
DTC B0086 3A: Right Front Side Impact Sensor Incorrect Component Installed
DTC B0086 71: Right Front Side Impact Sensor Invalid Data
DTC B0087 01: Left Rear Side Impact Sensor Short to Battery
DTC B0087 02: Left Rear Side Impact Sensor Short to Ground
DTC B0087 04: Left Rear Side Impact Sensor Open
DTC B0087 05: Left Rear Side Impact Sensor High/Voltage Open
DTC B0087 0C: Left Rear Side Impact Sensor Low Current
DTC B0087 39: Left Rear Side Impact Sensor Internal Malfunction
DTC B0087 3A: Left Rear Side Impact Sensor Incorrect Component Installed
DTC B0087 71: Left Rear Side Impact Sensor Invalid Serial Data Received
DTC B0088 01: Right Rear Side Impact Sensor Short to Battery
DTC B0088 02: Right Rear Side Impact Sensor Short to Ground

DTC B0088 04: Right Rear Side Impact Sensor Open
DTC B0088 05: Right Rear Side Impact Sensor High/Voltage Open
DTC B0088 0C: Right Rear Side Impact Sensor Low Current
DTC B0088 39: Right Rear Side Impact Sensor Internal Malfunction
DTC B0088 3A: Right Rear Side Impact Sensor Incorrect Component Installed
DTC B0088 71: Right Rear Side Impact Sensor Invalid Data

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Front Impact Sensor High Signal	B0083 02, B0083 0C	B0083 04, B0083 05	B0083 01	B0083 3A
Left Front Impact Sensor Low Reference	B0083 02, B0083 0C	B0083 04, B0083 05	B0083 01	B0083 3A
Right Front Impact Sensor High Signal	B0084 02, B0084 0C	B0084 04, B0084 05	B0084 01	B0084 3A
Right Front Impact Sensor Low Reference	B0084 02, B0084 0C	B0084 04, B0084 05	B0084 01	B0084 3A
Left Front Side Impact Sensor High Signal	B0085 02, B0085 0C	B0085 04, B0085 05	B0085 01	B0085 39
Left Front Side Impact Low Reference	B0085 02, B0085 0C	B0085 04, B0085 05	B0085 01	B0085 39
Right Front Side Impact Sensor High Signal	B0086 02, B0086 0C	B0086 04, B0086 05	B0086 01	B0086 39
Right Front Side Impact Sensor Low Reference	B0086 02, B0086 0C	B0086 04, B0086 05	B0086 01	B0086 39
Left Rear Side Impact Sensor High Signal	B0087 02, B0087 0C	B0087 04, B0087 05	B0087 01	B0087 39
Left Rear Side Impact Sensor Low Reference	B0087 02, B0087 0C	B0087 04, B0087 05	B0087 01	B0087 39
Right Rear Side Impact Sensor High Signal	B0088 02, B0088 0C	B0088 04, B0088 05	B0088 01	B0088 39
Right Rear Side Impact Sensor Low Reference	B0088 02, B0088 0C	B0088 04, B0088 05	B0088 01	B0088 39

Circuit/System Description

The impact sensors are equipped on vehicles to supplement the Supplemental Inflatable Restraint (SIR) System performance. The impact sensors are electronic and are not part of the deployment loops, but instead provide inputs to the Inflatable Restraint Sensing and Diagnostic Module. The impact sensors can assist in determining the severity of some frontal and side collisions. The Inflatable Restraint Sensing and Diagnostic Module uses the input from the impact sensors to assist in determining the severity of a collision further supporting air bag deployment. If the Inflatable Restraint Sensing and Diagnostic Module determines a deployment is warranted, the Inflatable Restraint Sensing and Diagnostic Module will cause current to flow through the deployment loops deploying the air bags.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

Any of the following conditions exist for 10 seconds:

B0083 01, B0084 01, B0085 01, B0086 01, B0087 01, B0088 01

The sensor has been shorted to voltage.

B0083 02, B0084 02, B0085 02, B0086 02, B0087 02, B0088 02

- The sensor has been shorted to ground.
- The sensor current is greater than 23 mA for greater than 5 milliseconds.

B0083 04, B0084 04, B0085 04, B0086 04, B0087 04, B0088 04

- The sensor circuit is open.
- The Inflatable Restraint Sensing and Diagnostic Module has not received a message from the sensor for greater than 375 milliseconds.

B0083 05, B0084 05, B0085 05, B0086 05, B0087 05, B0088 05

- The sensor circuit is open or high resistance.
- The Inflatable Restraint Sensing and Diagnostic Module has not received a message from the sensor for greater than 375 milliseconds.

B0083 0C, B0084 0C, B0085 0C, B0086 0C, B0087 0C, B0088 0C

- The sensor has been shorted to ground.
- The sensor current is greater than 23 mA for greater than 5 milliseconds.

B0083 39, B0084 39, B0085 39, B0086 39, B0087 39, B0088 39

- The Inflatable Restraint Sensing and Diagnostic Module has received a Not OK message from the sensor.
- The Inflatable Restraint Sensing and Diagnostic Module has not received a message.

B0083 3A, B0084 3A, B0085 3A, B0086 3A, B0087 3A, B0088 3A

- The Inflatable Restraint Sensing and Diagnostic Module has received identification message from the sensor, which does not match the identification stored in the Inflatable Restraint Sensing and Diagnostic Module memory.
- The Inflatable Restraint Sensing and Diagnostic Module has reset the sensor twice without detecting the correct identification message.

B0083 71, B0084 71, B0085 71, B0086 71, B0087 71, B0088 71

The Inflatable Restraint Sensing and Diagnostic Module has received invalid serial data from the sensor.

Action Taken When the DTC Sets

The Inflatable Restraint Sensing and Diagnostic Module requests the instrument panel cluster to illuminate the AIR BAG indicator.

Conditions for Clearing the DTC

- The condition for setting the DTC no longer exists.
- A history DTC will clear once 100 malfunction-free ignition cycles have occurred.
- An ignition cycle is required for the DTC to go from current to history.

Diagnostic Aid

Note: The following diagnostic aids apply for both current and history DTCs.

Terminal fretting, damaged terminals, damaged connectors, or incorrectly seated connectors can cause an open/high resistance condition. Check the circuit terminals for fretting or incorrectly seated connector if a DTC with symptom byte 05 is set.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Connector Repairs on page 11-895*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note:

- Refer to *SIR Service Precautions on page 12-152*.
- Inspect all terminals for damage or corrosion when disconnecting connectors. Damage or corrosion in the following requires repair or replacement of the affected component/connector.
  - Impact sensor
  - Inflatable Restraint Sensing and Diagnostic Module
  - Impact sensor wiring harness connector
  - Inflatable Restraint Sensing and Diagnostic Module wiring harness connector
- The connector and connector position assurance (CPA) may seat independent of each other. Both the connector and CPA should seat with an audible and/or tactile click. The CPA isolates the shorting-bars within the connector allowing the deployment circuit to operate properly. Replace any CPA that is damaged or missing.
- If the condition is intermittent or cannot be duplicated, disconnect the connectors and add dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087). This procedure will correct the high resistance condition due to terminal fretting corrosion.

1. Verify that DTC B0083–B0088 symptom byte 3A, 39, or 71 is not set as current.

⇒ **If DTC B0083–B0088 symptom byte 3A, 39 or 71 is set as current**

Replace the appropriate B59 or B63 Impact Sensor.

⇓ **If DTC B0083–B0088 symptom byte 3A, 39 or 71 is not set as current**

2. Verify that DTC B0083–B0088 symptom byte 01, 02, 04, or 05 is not set as current.

⇒ **If DTC B0083–B0088 symptom byte 01, 02, 04, or 05 is set as current**

Refer to Circuit/System Testing.

⇓ **If DTC B0083–B0088 symptom byte 01, 02, 04, 05 is not set as current**

3. All OK.

Circuit/System Testing

1. Vehicle OFF, disconnect the harness connector at the appropriate B59 or B63 Impact Sensor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 2 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF, disconnect the harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

2.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 10 Ω**

3. Test for greater than 50k Ω between the signal circuit terminal 1 and ground.

⇒ **If 50k Ω or less**

3.1. Disconnect the harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

3.2. Test for infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If greater than 50k Ω**

4. Vehicle in Service Mode, wait 1 min, test for less than 1 V between the signal circuit terminal 1 and ground.

⇒ **If greater than 1 V**

4.1. Disconnect the harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

4.2. Vehicle in Service Mode, test for less than 1 V between the signal circuit and ground.

⇒ If greater than 1 V, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 1 V**

Note: When using the MIN MAX function, autorange on the DMM may not function properly. To ensure accurate test results, turn off autorange and manually set the DMM range to 000.0 V.

5. Vehcile OFF, install a DMM between the signal circuit terminal 1 and ground. Set the DMM to capture DC voltage using the MIN MAX function. Turn off autorange and manually set the DMM range to 000.0 V. Vehicle in Service Mode.
6. Verify the MAX voltage captured by the DMM is between 4–9V.

⇒ **If less than 4 V**

6.1. Disconnect the X2 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

6.2. Test for infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇒ **If greater than 9V**

6.1. Vehicle OFF. Disconnect the X2 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module. Ignition ON.

6.2. Test for less than 1 V between the signal circuit terminal 1 and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If between 4–9V**

7. Vehicle OFF, connect all harness connectors, press in the CPA (if equipped) until an audible and/or tactile click is heard.
8. Vehicle ON, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.
9. Verify the DTC does not set.

⇒ **If the DTC sets**

Replace the B59 or B63 Impact Sensor.

⇓ **If the DTC does not set**

10. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Airbag Front End Discriminating Sensor Replacement on page 12-154*
- *Airbag Side Impact Center Pillar Sensor Replacement on page 12-166*
- *Airbag Side Impact Sensor Replacement - Front Side Door on page 12-168*
- *Control Module References on page 6-3* for Inflatable Restraint Sensing and Diagnostic Module replacement, programming and setup

DTC B0091

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0091 01: Front Impact Sensor Short to Battery
DTC B0091 02: Front Impact Sensor Short to Ground
DTC B0091 04: Front Impact Sensor Open Circuit
DTC B0091 05: Front Impact Sensor High Voltage/Open
DTC B0091 0C: Front Impact Sensor Low Current
DTC B0091 39: Front Impact Sensor Internal Electronic Failure
DTC B0091 3A: Front Impact Sensor Incorrect Component Installed
DTC B0091 71: Front Impact Sensor Invalid Serial Data Received

Diagnostic Fault Information

Circuit	Short to Ground	High Resist-ance	Open	Short to Voltage	Signal Performance
Front Impact Sensor High Signal	B0091 02	B0091 04	B0091 0C , B0091 04	B0091 01, B0091 05	B0091 39, B0091 71
Front Impact Sensor Low Reference	B0091 02	B0091 04	B0091 0C , B0091 04	B0091 01	B0091 39, B0091 71

Circuit/System Description

The impact sensors are equipped on vehicles to supplement the Supplemental Inflatable Restraint (SIR) System performance. The impact sensors are electronic and are not part of the deployment loops, but instead provide inputs to the Inflatable Restraint Sensing and Diagnostic Module. The impact sensors can assist in determining the severity of some frontal and side collisions. The Inflatable Restraint Sensing and Diagnostic Module uses the input from the impact sensors to assist in determining the severity of a collision further supporting air bag deployment. If the Inflatable Restraint Sensing and Diagnostic Module determines a deployment is warranted, the Inflatable Restraint Sensing and Diagnostic Module will cause current to flow through the deployment loops deploying the appropriate air bags. The Front impact sensor and side impact sensors utilize a bidirectional 2-wire circuit. The sensors modulate current on the interface to send identification, state of health, and deployment commands to the inflatable restraint sensing and diagnostic module. The Inflatable Restraint Sensing and Diagnostic Module serves as a power source and a ground for the sensors. When the ignition is turned ON and input power from the Inflatable Restraint Sensing and Diagnostic Module is first detected, the sensors respond by performing internal diagnostics and sending an identification to the Inflatable Restraint Sensing and Diagnostic Module. The Inflatable Restraint Sensing and Diagnostic Module considers the identification to be valid if the response time is less than 5 seconds. The sensors continually communicate status messages to the Inflatable Restraint Sensing and Diagnostic Module, which determines if a fault is present in the sensor circuit. When a fault is detected, the Inflatable Restraint Sensing and Diagnostic Module may reset the sensors up to 2 times by removing and reapplying power to it. If the fault is still present, the Inflatable Restraint Sensing and Diagnostic Module will set a DTC.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

B0091 01

The Inflatable Restraint Sensing and Diagnostic Module has detected the Front impact sensor has been shorted to voltage

B0091 02

- The Inflatable Restraint Sensing and Diagnostic Module has detected the Front impact sensor has been shorted to ground.
- The Front impact sensor current is greater than 23 mA for greater than 5 milliseconds.

B0091 04

- The Inflatable Restraint Sensing and Diagnostic Module has detected an open/high resistance in the Front impact sensor.
- The Inflatable Restraint Sensing and Diagnostic Module has not received a message from the Front impact sensor for greater than 375 milliseconds.

B0091 05 and B0091 0C

- The Inflatable Restraint Sensing and Diagnostic Module has detected the Front impact sensor has been shorted to voltage.
- The Inflatable Restraint Sensing and Diagnostic Module has detected an open/high resistance in the Front impact sensor.
- The Inflatable Restraint Sensing and Diagnostic Module has not received a message from the Front impact sensor for greater than 375 milliseconds.

B0091 39

- The Inflatable Restraint Sensing and Diagnostic Module has received a Not OK (NOK) message from the Front impact sensor.
- The Inflatable Restraint Sensing and Diagnostic Module has not received a message.

B0091 3A

- The Inflatable Restraint Sensing and Diagnostic Module has received identification message from the Front impact sensor which does not match the identification stored in the Inflatable Restraint Sensing and Diagnostic Module memory.
- The Inflatable Restraint Sensing and Diagnostic Module has reset the Front impact sensor twice without detecting the correct identification message.

B0091 71

The Inflatable Restraint Sensing and Diagnostic Module has received invalid serial data from the Front impact sensor.

Action Taken When the DTC Sets

- The Inflatable Restraint Sensing and Diagnostic Module requests the instrument panel cluster to illuminate the AIR BAG indicator.
- The SIR system is disabled and no deployments are allowed.

Conditions for Clearing the DTC

- The condition for setting the DTC no longer exists.
- A history DTC will clear once 100 malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*
- *Connector Repairs on page 11-895*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. For DTC B0091 39, B0091 3A and B0091 71, replace the B59 Front Impact Sensor.
2. For DTC B0091 01, B0091 02, B0091 04, B0091 05 and B0091 0C, perform the Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF.
2. Disconnect the harness connector at the B59 Front Impact Sensor, wait 120 seconds.
3. Test for less than 10 Ω between the low reference circuit terminal 2 and ground.

⇒ **If 10 Ω or greater**

3.1. Ignition OFF, disconnect the X2 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

3.2. Test for less than 2 Ω in the low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 10 Ω**

4. Test for greater than 50k Ω between the signal circuit terminal 1 and ground.

⇒ **If 50k Ω or less**

4.1. Disconnect the X2 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

4.2. Test for infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If greater than 50k Ω**

5. Disconnect the X2 harness connector at the Inflatable Restraint Sensing and Diagnostic Module.
6. Test for less than 2 Ω between the B59 Front Impact Sensor signal circuit terminal 1 and the Inflatable Restraint Sensing and Diagnostic Module terminal 23 X2.

⇒ **If 2 Ω or greater**

7. Repair the open/high resistance in the circuit.

⇓ **If less than 2 Ω**

8. Replace the B59 Front Impact Sensor.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Airbag Front End Discriminating Sensor Replacement on page 12-154*
- *Control Module References on page 6-3* for Inflatable Restraint Sensing and Diagnostic Module replacement, programming and setup

DTC B0098

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B0098 02: Passenger Air Bag Disable Switch Circuit Short to Ground
DTC B0098 05: Passenger Air Bag Disable Switch Circuit High Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Passenger Air Bag Disable Switch Signal	B0098 02	B0098 05	B0098 05	—
Passenger Air Bag Disable Switch Ground	—	B0098 05	B0098 05	—

Circuit/System Description

When the ignition switch is turned to ON, the sensing and diagnostic module (SDM) will perform turn-on test to diagnose critical malfunctions within SDM itself. The SDM continuously checks the disable switch position switch and circuit defect by letting the regular voltage flow through the disable switch circuit and verifying the current.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

B0098 02

The SDM detects a short to ground in the passenger air bag disable switch signal circuit.

B0098 05

The SDM detects a short to voltage or an open/high resistance in the passenger air bag disable switch signal circuit or the passenger air bag disable switch ground circuit.

Action Taken When the DTC Sets

The SDM will ignore the signal from the passenger air bag disable switch and will continuously enable the passenger air bag.

Conditions for Clearing the DTC

- The DTC will be current for as long as the fault is present.
- When the fault is no longer present, the DTC will be a history DTC.
- A history DTC will clear after 50 ignition cycles.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*
- *Connector Repairs on page 11-895*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Observe the scan tool Passenger Air Bag Disabled Switch parameter while commanding the passenger air bag ON and OFF by using the S40 passenger air bag disable switch. The value should change between On and Off

Circuit/System Testing

1. Vehicle OFF.
2. Disconnect the harness connector at the S40 passenger air bag disable switch.
3. Test for less than 30 Ω between the low reference circuit terminal 3 and ground.

⇒ **If 30 Ω or greater**

3.1. Ignition OFF, disconnect the X1 harness connector at the K36 SDM.

3.2. Test for less than 2 Ω in the S40 passenger air bag disable switch ground circuit end to end.

⇒ If 2 Ω or greater, replace the coil or repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 SDM.

⇓ **If less than 30 Ω**

4. Vehicle in Service Mode, test for 4.75–5.25 V between the signal circuit terminal 1 and ground.

⇒ **If less than 4.75 V**

4.1. Disconnect the X1 harness connector at the K36 SDM.

4.2. Test for infinite resistance between the signal circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

4.3. Test for less than 2 Ω in the signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 SDM.

⇒ **If greater than 5.25 V**

4.1. Vehicle OFF.

4.2. Disconnect the X1 harness connector at the K36 SDM.

4.3. Ignition ON.

4.4. Test for less than 1 V between the signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K36 SDM.

⇓ **If between 4.75–5.25 V**

5. Replace the S40 passenger air bag disable switch.

Component Testing

1. Disconnect the harness connector at the S40 passenger air bag disable switch.
2. With the switch open, test for 380–420 Ω between the signal terminal 1 and the ground terminal 3.

⇒ **If not between 380–420 Ω**

Replace the S40 passenger air bag disable switch.

⇓ **If between 380–420 Ω**

3. With the switch closed, test for 95–105 Ω, between the signal terminal 1 and the ground terminal 3.

⇒ **If not between 95–105 Ω**

Replace the S40 passenger air bag disable switch.

⇓ **If between 95–105 Ω**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the diagnostic procedure.

Control Module References on page 6-3 for SDM control module replacement, programming and setup

DTC B1001

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category

DTC Descriptor

DTC B1001 00: Option Configuration

Circuit/System Description

The inflatable restraint sensing and diagnostic module stores a primary data key, which is a 4-digit number. When the ignition is turned ON, the inflatable restraint sensing and diagnostic module compares this information to the information stored in the body control module (BCM) via serial data. If there is a mismatch between the information stored in the inflatable restraint sensing and diagnostic module and body control module, DTC B1001 will set.

Conditions for Running the DTC

System voltage is between 9–16 V.

Conditions for Setting the DTC

The 4-digit Primary Data Key stored in the inflatable restraint sensing and diagnostic module does not match the 4 digits stored in the body control module.

Action Taken When the DTC Sets

- The inflatable restraint sensing and diagnostic module requests the instrument cluster to illuminate the AIR BAG indicator.
- The inflatable restraint sensing and diagnostic module disables all deployments.

Conditions for Clearing the DTC

The last 4-digit Primary Data Key in the inflatable restraint sensing and diagnostic module matches the last 4 digits stored in the Body Control Module.

Diagnostic Aids

- This DTC is an indication that an incorrect inflatable restraint sensing and diagnostic module is installed in the vehicle, or that the inflatable restraint sensing and diagnostic module and/or the body control module was replaced without reprogramming the body control module with the new information.
- If the inflatable restraint sensing and diagnostic module was previously programmed and DTC B1001 is now set, the setup portion of program was not completed. Proceed to the inflatable restraint sensing and diagnostic module setup portion of the *Inflatable Restraint Sensing and Diagnostic Module Programming and Setup on page 6-13*

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*
- *Connector Repairs on page 11-895*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify the scan tool K36 Inflatable Restraint Sensing and Diagnostic Module Primary Key Status paramater is Valid.

⇒ **If the K36 Inflatable Restraint Sensing and Diagnostic Module Primary Key Status parameter is Invalid**

Perform the K36 Inflatable Restraint Sensing and Diagnostic Module setup. Refer to *Inflatable Restraint Sensing and Diagnostic Module Programming and Setup on page 6-13*.

⇓ **If the K36 Inflatable Restraint Sensing and Diagnostic Module Primary Key Status parameter is Valid**

2. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *SIR/SRS Wiring Repairs on page 11-894*
- *Control Module References on page 6-3* for inflatable restraint sensing and diagnostic module replacement, programming and setup

DTC B1019

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC B1019 00: System Configuration Error

Circuit/System Description

The inflatable restraint sensing and diagnostic module (SDM) monitors the number of safety components installed on the vehicle. When the Vehicle is turned ON, the Inflatable Restraint Sensing and Diagnostic Module evaluates the number of safety components installed and compares it to the number of components the Inflatable Restraint Sensing and Diagnostic Module expects to see on the vehicle with its current calibration. If there is a mismatch between detected components and the components programmed with the Inflatable Restraint Sensing and Diagnostic Module calibration, DTC B1019 will set. The components (if equipped) that the Inflatable Restraint Sensing and Diagnostic Module will detect include inflatable restraint deployment loops, impact sensors, passenger presence system components, seat position sensors, disable switches, and seat belt switches.

Conditions for Running the DTC

Ignition voltage is between 9–16 V.

Conditions for Setting the DTC

The setup for the Inflatable Restraint Sensing and Diagnostic Module has not been completed and the Inflatable Restraint Sensing and Diagnostic Module does not detect the correct number of sensors or deployment loops than is expected with this calibration.

Action Taken When the DTC Sets

- The Inflatable Restraint Sensing and Diagnostic Module requests the Instrument Cluster to illuminate the AIR BAG warning indicator.
- The DTC must be cleared before running the setup Inflatable Restraint Sensing and Diagnostic Module.
- Air bag indicator will continue to flash until Inflatable Restraint Sensing and Diagnostic Module setup procedure is complete.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present.
- A history DTC will clear once 100 malfunction-free ignition cycles have occurred.

Diagnostic Aids

The Inflatable Restraint Sensing and Diagnostic Module scan tool deployment loop and impact sensor data will match what the Inflatable Restraint Sensing and Diagnostic Module has been programmed to expect to see on the vehicle. B1019 DTC will set if a deployment loop or impact sensor is added or removed from the system.

DTC B1019 will set when an open/high resistance DTC sets for a deployment loop or impact sensor. This causes mismatch between the learned and actual components connected to the Inflatable Restraint Sensing and Diagnostic Module.

DTC B1019 can set with no other DTCs if an unused deployment loop or impact sensor circuit is shorted to ground. This causes a mismatch between the learned and actual components connected to the Inflatable Restraint Sensing and Diagnostic Module.

Reference Information

Schematic Reference

- *Seat Belt Schematics on page 12-82*
- *SIR Schematics on page 12-101*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

- *Seat Belt System Description and Operation on page 12-98*
- *Supplemental Inflatable Restraint System Description and Operation on page 12-182*

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Connector Repairs on page 11-895*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note: DTC B1019 can set after the inflatable restraint sensing and diagnostic module has been replaced and/or reprogrammed before the setup procedure is completed. The setup procedure cannot be completed if DTC B1019 is set as current or history. If a short or open is detected in a deployment circuit prior to the setup procedure being performed, the inflatable restraint sensing and diagnostic module will set DTC B1019.

1. Vehicle in Service Mode.
2. Verify no other Inflatable Restraint Sensing and Diagnostic Module DTCs are set.

⇒ **If other inflatable restraint sensing and diagnostic module DTCs are set**

Diagnose those DTCs first. Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*

⇓ **If no other inflatable restraint sensing and diagnostic module DTCs are set**

3. Verify the impact sensors called out in the scan tool data list match the number of actual impact sensors installed on the vehicle.

⇒ **If the number of impact sensors do not match**

3.1. Verify the correct Inflatable Restraint Sensing and Diagnostic Module calibration file is loaded in the inflatable restraint sensing and diagnostic module.

⇒ If the inflatable restraint sensing and diagnostic module calibration file is correct and the vehicle contains an incorrect number of sensors, identify which sensors are missing to make the vehicle match the inflatable restraint sensing and diagnostic module impact sensor calibration scan tool data list.

⇓ If the calibration file is incorrect

3.2. Reprogram the Inflatable Restraint Sensing and Diagnostic Module. Refer to *Inflatable Restraint Sensing and Diagnostic Module Programming and Setup on page 6-13*

⇓ **If the number of impact sensors match**

4. Verify the enabled deployment loops called out in the scan tool data list match the deployment loops installed on the vehicle.

⇒ **If the number of enabled deployment loops do not match**

4.1. Verify the correct Inflatable Restraint Sensing and Diagnostic Module calibration file is loaded in the inflatable restraint sensing and diagnostic module.

⇒ If the inflatable restraint sensing and diagnostic module calibration file is correct and the vehicle contains an incorrect number of loops, identify which deployment loops are missing to make the vehicle match the inflatable restraint sensing and diagnostic module impact sensor calibration scan tool data list.

⇓ If the calibration file is incorrect

4.2. Reprogram the Inflatable Restraint Sensing and Diagnostic Module. Refer to *Inflatable Restraint Sensing and Diagnostic Module Programming and Setup on page 6-13*

⇓ **If the number of enabled deployment loops match**

5. Verify a passenger presence system is equipped on the vehicle.

⇒ **If a passenger presence system is not equipped on the vehicle**

Replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If a passenger presence system is equipped on the vehicle**

6. Verify the passenger presence enable status called out in the scan tool data list is enabled.

⇒ **If the passenger presence enable status is not enabled**

Refer to *Inflatable Restraint Sensing and Diagnostic Module Programming and Setup on page 6-13*

⇓ **If the passenger presence is enabled**

7. Verify the passenger presence learn status called out in the scan tool data list is learned.

⇒ **If the passenger presence learn status is not learned**

7.1. Verify the scan tool can communicate with the passenger presence system.

⇒ If the scan tool will not communicate with the passenger presence system, refer to *Scan Tool Does Not Communicate with Low Speed GMLAN Device on page 11-229*

⇓ If the scan tool communicates

7.2. Vehicle OFF, disconnect the scan tool, wait two minutes.

7.3. Vehicle in Service Mode, verify DTC B1019 is not set as current.

⇒ If the DTC is set as current, refer to *Inflatable Restraint Sensing and Diagnostic Module Programming and Setup on page 6-13*

⇓ If the DTC is not set as current

7.4. All OK.

⇓ **If the passenger presence learn status is learned**

8. Replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the diagnostic procedure.

- *SIR/SRS Wiring Repairs on page 11-894*
- *Control Module References on page 6-3* for Inflatable Restraint Sensing and Diagnostic Module replacement, programming and setup

Passenger Presence System Rezeroing

Introduction

The inflatable restraints passenger presence system (PPS) is a calibrated system that requires rezeroing anytime the seat cushion trim attachments have been removed or the PPS has been replaced. The procedures below are designed to assist in the rezeroing of the PPS. Before you start, read these procedures carefully and completely. For further information regarding the PPS refer to *Supplemental Inflatable Restraint System Description and Operation on page 12-182*.

Note: The following procedures must be followed:

1. Read this procedure carefully and completely.
2. The PPS will not function properly if the PPS rezeroing procedure is not performed.
3. Perform the *Diagnostic Repair Verification on page 6-123* after successfully completing the rezeroing procedure to ensure the system is functioning properly.

Passenger Presence System (PPS) Rezeroing Procedure

Note: Before rezeroing the PPS, the front passenger seat must be completely empty of all items. The presence of any items on the front passenger seat will affect the calibration and operation of the PPS. The passenger seat must be between 0°C to 45°C (32°F to 113°F).

1. Empty the front outboard passenger seat.
2. Verify that all SIR and PPS components, connectors, and connector position assurances (CPAs) are properly connected and mounted.
3. Install a scan tool.
4. Turn ON the ignition, with the engine OFF.

   Note: DTC B0081 4B may be set prior to rezeroing the system if the system was replaced with a service kit. All other SIR and PPS DTCs must be cleared before rezeroing the PPS. The presence of current or history DTCs will prevent the PPS from rezeroing and may set additional DTCs.
5. Use the scan tool in order to clear the SIR and PPS DTCs.
6. With a scan tool, request the Passenger Presence Sensor Learn procedure.
7. Initiate the Passenger Presence Sensor Learn procedure. The PPS will illuminate both PASSENGER AIR BAG ON and OFF indicators until this procedure has been completed.
8. When the Passenger Presence Sensor Learn procedure has been successfully completed, the PPS will display the current system status.
9. If the Passenger Presence Sensor Learn procedure was unsuccessful, repeat this procedure. Due to the communication status between the SDM and the PPS module, this procedure may have to be repeated until a successful rezero attempt has been achieved.
10. After the PPS has been successfully rezeroed, perform the *Diagnostic Repair Verification on page 6-123*.

Symptoms - SIR

Note: Complete the following steps before using the symptom tables:

1. Perform *Diagnostic System Check - Vehicle on page 6-91* before using the symptom tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The inflatable restraint sensing and diagnostic module (SDM) can communicate via the serial data link.
2. Review the SIR system description and operation in order to familiarize yourself with the system functions. Refer to *Supplemental Inflatable Restraint System Description and Operation on page 12-182*.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the SIR system. Refer to *Checking Aftermarket Accessories on page 11-871*.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.

Symptom List

Refer to *Airbag Indicator Malfunction (Driver) on page 12-147* or *Airbag Indicator Malfunction (Passenger) on page 12-149* in order to diagnose the symptom.

Airbag Indicator Malfunction (Driver)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Circuit/System Description

With the Vehicle in Service Mode, during the bulb check, the driver air bag indicator will flash, and then turn OFF after the bulb check. The Inflatable Restraint Sensing and Diagnostic Module (SDM) performs diagnostic tests on the SIR system during the bulb check. If any malfunction exists the Inflatable Restraint Sensing and Diagnostic Module will request the

instrument cluster to illuminate the air bag indicator steady, via serial data. If a preexisting malfunction exists, the air bag indicator will illuminate steady immediately after the ignition is turned ON. If the ignition 1 voltage is outside of the normal operating voltage range of 9–16 V, the Inflatable Restraint Sensing and Diagnostic Module will command the instrument cluster to illuminate the air bag indicator ON, even with no DTCs present, and then disable all deployment loops.

Diagnostic Aids

- A DTC B1370 may set if the ignition 1 circuit is outside the 9–16 V range.
- A flashing driver air bag indicator is displayed if the inflatable restraint sensing and diagnostic module was programmed but did not fully complete the programming. For a flashing driver airbag indicator, refer to *Inflatable Restraint Sensing and Diagnostic Module Programming and Setup on page 6-13*.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Connector Repairs on page 11-895*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

If the driver air bag indicator is flashing, refer to *Inflatable Restraint Sensing and Diagnostic Module Programming and Setup on page 6-13*.

Circuit/System Testing

1. Vehicle in Service Mode. With a scan tool, verify Inflatable Restraint Sensing and Diagnostic Module DTCs are not set.

⇒ **If Inflatable Restraint Sensing and Diagnostic Module DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If Inflatable Restraint Sensing and Diagnostic Module DTCs are not set**

2. With a scan tool command the Instrument Cluster to turn all instrument cluster indicators ON and OFF. The air bag indicator should turn ON and OFF as commanded.

⇒ **If air bag indicator does not turn on or off**

If the air bag indicator does not turn ON and OFF as expected, replace the P16 Instrument Cluster.

⇓ **If air bag indicator does turn on or off**

3. Replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the diagnostic procedure.

- *SIR/SRS Wiring Repairs on page 11-894*
- *Control Module References on page 6-3* for Instrument Cluster or Inflatable Restraint Sensing and Diagnostic Module replacement, programming and setup

Airbag Indicator Malfunction (Passenger)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Passenger Air Bag OFF Indicator Control	2	2*	4	—
Passenger Air Bag ON Indicator Control	3	3*	5	—
Passenger Air Bag Disable Indicator Ground	—	1	1	—

1. Both indicators always OFF
2. The OFF indicator will not illuminate
3. The ON indicator will not illuminate
4. The OFF indictor always ON
5. The ON indicator always ON

* High resistance may cause the appropriate indicator to illuminate less bright than normal

Circuit/System Description

The passenger air bag ON/OFF indicators are used to notify the driver when the passenger presence system has enabled or disabled the passenger instrument panel air bag. When the vehicle is placed in service mode, the ignition voltage is supplied to the passenger presence module. When the Inflatable Restraint Sensing and Diagnostic Module (SDM) receives the appropriate serial data message from the passenger presence module the SDM will then provide voltage to the appropriate indicator.

Reference Information

Schematic Reference

SIR Schematics on page 12-101

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Supplemental Inflatable Restraint System Description and Operation on page 12-182

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note: The passenger air bag ON and OFF indicators may not operate as expected if there are supplemental inflatable restraint (SIR) DTCs. Repair all SIR DTCs before proceeding with this diagnostic.

1. Vehicle in Service Mode.
2. Verify the passenger air bag ON indicator turns ON and OFF when commanding the Passenger Air Bag ON Indicator ON and OFF with a scan tool.

⇒ **If the air bag ON indicator does not turn ON or OFF**

Refer to Circuit/System Testing.

⇓ **If the air bag ON indicator turns ON or OFF**

3. Verify the passenger air bag OFF indicator turns ON and OFF when commanding the Passenger Air Bag OFF Indicator ON and OFF with a scan tool.

⇒ **If the air bag OFF indicator does not turn ON or OFF**

Refer to Circuit/System Testing.

⇓ **If the air bag OFF indicator turns ON or OFF**

4. All OK.

Circuit/System Testing

Note: When removing connectors inspect for damage or corrosion. Damage or corrosion in the following requires repair or replacement of the affected.

- P17 Info Display Module
- P17 Info Display Module wiring harness.

- K36 Inflatable Restraint Sensing and Diagnostic Module
- K36 Inflatable Restraint Sensing and Diagnostic Module wiring harness.

1. Vehicle OFF, disconnect the harness connector at the P17 Info Display Module.
2. Test for less than 10 Ω between the ground circuit terminal 7 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode, command the passenger air bag OFF indicator OFF with a scan tool.
4. Test for less than 11 V between the control circuit terminal 6 and ground.

⇒ **If 11 V or greater**

4.1. Vehicle OFF, disconnect the X1 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module, vehicle in Service Mode.

4.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 11 V**

5. Command the passenger air bag OFF indicator ON with a scan tool.
6. Test for greater than 4 V between the control circuit terminal 6 and ground.

⇒ **If 4 V or less**

6.1. Disconnect the X1 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

6.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If greater than 4 V**

7. Command the passenger air bag ON indicator OFF with a scan tool.
8. Test for less than 11 V between the control circuit terminal 5 and ground.

⇒ **If 11 V or greater**

8.1. Vehicle OFF, disconnect the X1 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module, vehicle in Service Mode.

8.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If less than 11 V**

9. Command the passenger air bag ON indicator ON with a scan tool.
10. Test for greater than 4 V between the control circuit terminal 5 and ground.

⇒ **If 4 V or less**

10.1. Disconnect the X1 harness connector at the K36 Inflatable Restraint Sensing and Diagnostic Module.

10.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

10.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K36 Inflatable Restraint Sensing and Diagnostic Module.

⇓ **If greater than 4 V**

11. Test or replace the P17 Info Display Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Information Center Telltale Assembly Replacement on page 8-94* for P17 Info Display Module replacement
- *Control Module References on page 6-3* for Inflatable Restraint Sensing and Diagnostic Module replacement, programming and setup

SIR Disabling and Enabling

SIR component location affects how a vehicle should be serviced. There are parts of the SIR system installed in various locations around a vehicle. To find the location of the SIR components refer to *Master Electrical Component List on page 11-343*.

There are several reasons for disabling the SIR system, such as repairs to the SIR system or servicing a component near or attached to an SIR component. There are several ways to disable the SIR system depending on what type of service is being performed. The following information covers the proper procedures for disabling/enabling the SIR system.

Condition	Action
If the vehicle was involved in an accident with an air bag deployment.	Disconnect the negative battery cable(s)
When performing SIR diagnostics.	Follow the appropriate SIR service manual diagnostic procedure(s) *
When moving, removing or replacing an SIR component or a component attached to an SIR component. (Anytime you remove fasteners.)	Disconnect the negative battery cable(s) *
If the vehicle is suspected of having shorted electrical wires.	Disconnect the negative battery cable(s) *
When performing electrical diagnosis on components other than the SIR system.	Remove the SIR/Airbag fuse(s) when indicated by the diagnostic procedure to disable the SIR system
* DTCs will be lost when the negative battery cable is disconnected.	

SIR Service Precautions

Warning: When performing service on or near the SIR components or the SIR wiring, the SIR system must be disabled. Failure to observe the correct procedure could cause deployment of the SIR components. Serious injury can occur. Failure to observe the correct procedure could also result in unnecessary SIR system repairs.

The Inflatable Restraint Sensing and Diagnostic Module (SDM) maintains a reserved energy supply. The reserved energy supply provides deployment power for the air bags if the Inflatable Restraint Sensing and Diagnostic Module loses battery power during a collision. Deployment power is available for as much as 2 minutes after disconnecting the vehicle power. Waiting 2 minutes before working on the system after disabling the SIR system prevents deployment of the air bags from the reserved energy supply.

General Service Instructions

The following are general service instructions which must be followed in order to properly repair the vehicle and return it to its original integrity:

- Do not expose air bags to temperatures above 65° C (149°F).
- Verify the correct replacement part number. Do not substitute a component from a different vehicle.
- Use only original GM replacement parts available from your authorized GM dealer. Do not use salvaged parts for repairs to the SIR system.

Discard any of the following components if it has been dropped from a height of 92 cm (3 feet) or greater:

- Inflatable Restraint Sensing and Diagnostic Module (SDM)
- Any air bag
- Driver steering wheel air bag coil
- Any impact sensor
- Seat belt anchor and/or retractor pretensioners
- Passenger presence module and/or occupant sensor

Disabling Procedure – Air Bag Fuse

1. Turn the steering wheel so that the vehicles wheels are pointing straight ahead.
2. Vehicle OFF.

Warning: The SDM may have more than one fused power input. To ensure there is no unwanted SIR deployment, personal injury, or unnecessary SIR system repairs, remove all fuses supplying power to the SDM. With all SDM fuses removed and the ignition switch in the ON position, the AIR BAG warning indicator illuminates. This is normal operation, and does not indicate a SIR system malfunction.

3. Locate and remove the fuse(s) supplying power to the Inflatable Restraint Sensing and Diagnostic Module. Refer to *SIR Schematics on page 12-101* or *Electrical Center Identification Views on page 11-430*.
4. Wait 2 minutes before working on the system.

Enabling Procedure – Air Bag Fuse

1. Vehicle OFF.
2. Install the fuse(s) supplying power to the Inflatable Restraint Sensing and Diagnostic Module. Refer to *SIR Schematics on page 12-101* or *Electrical Center Identification Views on page 11-430*.
3. Vehicle in Service Mode. The AIR BAG indicator will flash then turn OFF.
4. Perform the Diagnostic System Check – Vehicle if the AIR BAG warning indicator does not operate as described. Refer to *Diagnostic System Check - Vehicle on page 6-91*.

Disabling Procedure – Negative Battery Cable

1. Turn the steering wheel so that the vehicles wheels are pointing straight ahead.
2. Vehicle OFF.
3. Disconnect the negative battery cable from the battery. Refer to *Battery Negative Cable Disconnection and Connection on page 9-20*.
4. Wait 2 minutes before working on system.

Enabling Procedure – Negative Battery Cable

1. Vehicle OFF.
2. Connect the negative battery cable to the battery. Refer to *Battery Negative Cable Disconnection and Connection on page 9-20*.
3. Vehicle in Service Mode. The AIR BAG indicator will flash then turn OFF.
4. Perform the Diagnostic System Check – Vehicle if the AIR BAG warning indicator does not operate as described. Refer to *Diagnostic System Check - Vehicle on page 6-91*.

Repair Instructions

SIR Service Precautions

General Service Instructions

Warning: When performing service on or near the SIR components or the SIR wiring, the SIR system must be disabled. Refer to SIR Disabling and Enabling . Failure to observe the correct procedure could cause deployment of the SIR components, personal injury, or unnecessary SIR system repairs.

Warning: Do not strike or jolt the inflatable restraint sensing and diagnostic module (SDM). Before applying power to the SDM, make sure that it is securely fastened with the arrow facing toward the front of the vehicle. Failure to observe the correct installation procedure could cause SIR deployment, personal injury, or unnecessary SIR system repairs.

Note: The Inflatable Restraint Sensing and Diagnostic Module (SDM) maintains a reserved energy supply. The reserved energy supply provides deployment power for the SIR air bags. Deployment power may be available for up to 2 minutes after disconnecting the vehicle power. Disabling the SIR system prevents deployment of the SIR air bags from the reserved energy supply.

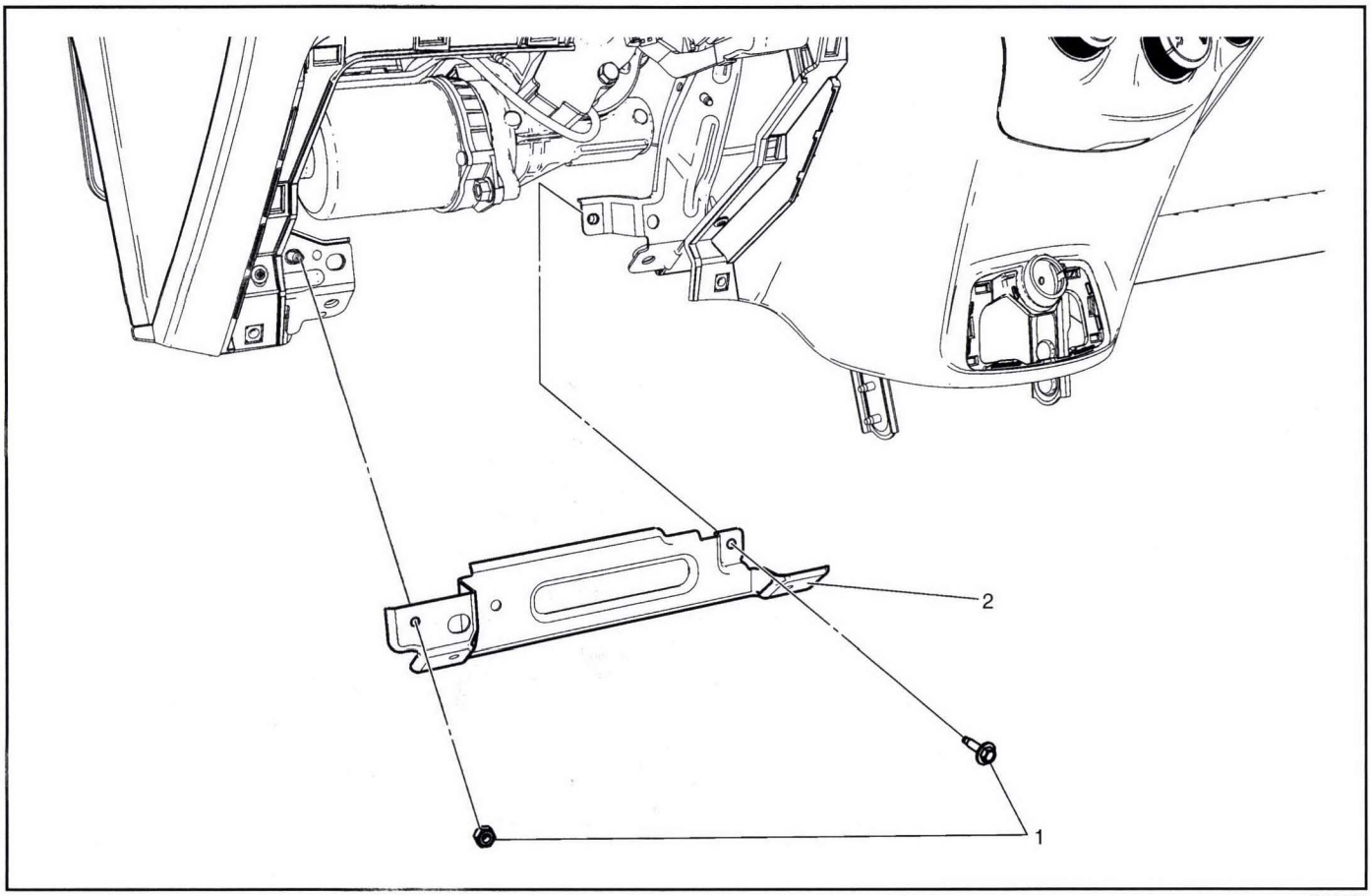
Note: The following are general service instructions which must be followed in order to properly repair the vehicle and return it to its original integrity:

- Do not expose air bags to temperatures above 85 °C (185 °F)
- Verify the correct replacement part number. Do not substitute a component from a different vehicle
- Use only original GM replacement parts available from your authorized GM dealer. Do not use salvaged parts for repairs to the SIR system

Note: Discard any of the following components if it has been dropped from a height of 80 cm (31.49 in) or greater:

- Inflatable Restraint Sensing and Diagnostic Module
- Passenger instrument panel air bag
- Driver steering wheel air bag
- Driver steering wheel air bag coil
- Roof rail air bags
- Front and /or side impact sensors
- Seat belt achor and/or retractor pretensioners
- Front seat side air bag
- Knee air bag

Instrument Panel Lower Airbag Bracket Replacement

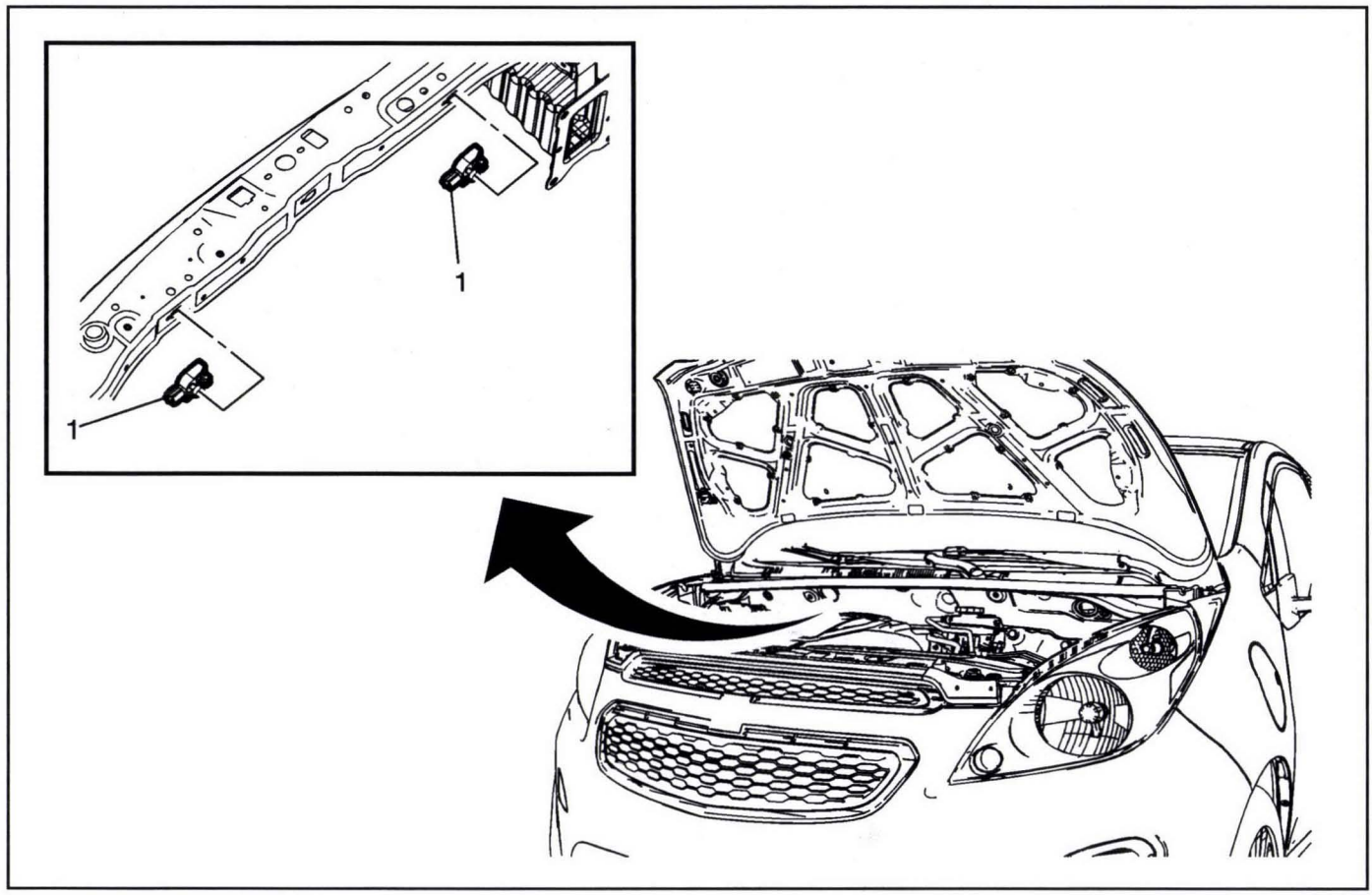


2754767

Instrument Panel Lower Airbag Bracket Replacement

Callout	Component Name
Preliminary Procedure Remove the driver knee air bag. Refer to *Instrument Panel Lower Airbag Replacement - Driver Side on page 12-160*.	
1	Instrument Panel Lower Airbag Bracket Fastener **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 5 N•m (44 lb in)
2	Instrument Panel Lower Airbag Bracket

Airbag Front End Discriminating Sensor Replacement

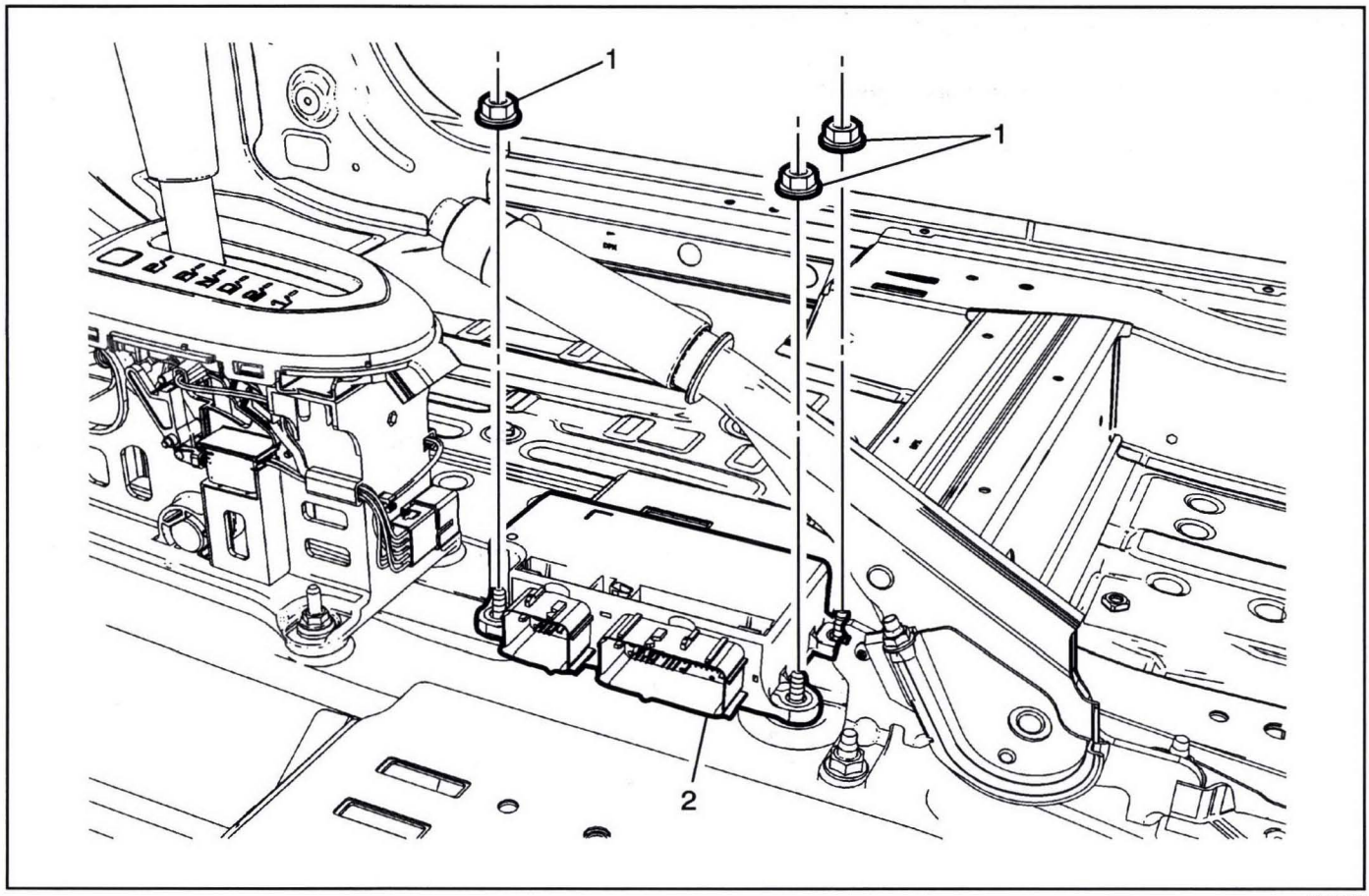


3211797

Airbag Front End Discriminating Sensor Replacement

Callout	Component Name
	Warning: Refer to SIR Warning on page 0-7.
	Preliminary Procedures 1. Disable the supplemental inflatable restraint (SIR) system. Refer to *SIR Disabling and Enabling on page 12-151*. 2. Remove the front compartment front sight shield. Refer to *Front Compartment Front Sight Shield Replacement on page 3-39*.
1	Inflatable Restraint Front End Discriminating Sensor Assembly (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*. **Procedure** 1. Disconnect electrical connector. 2. Loosen the bolts and slide the sensor out of the keyhole slots. 3. The bolts are integral to the sensor assembly and DO NOT remove separately. **Tighten** 7.5 N•m (66 lb in)

Airbag Sensing and Diagnostic Module Replacement



3211656

Airbag Sensing and Diagnostic Module Replacement

Callout	Component Name
Warning: Do not strike or jolt the inflatable restraint Sensing and Diagnostic Module (SDM). Before applying power to the SDM, make sure that it is securely fastened. Failure to observe the correct installation procedure could cause Supplemental Inflatable Restraint (SIR) deployment, personal injury, or unnecessary SIR system repairs. ***Warning: Refer to SIR Warning on page 0-7.*** **Preliminary Procedures** 1. Disable the supplemental inflatable restraint (SIR) system. Refer to *SIR Disabling and Enabling on page 12-151*. 2. Remove the front floor console. Refer to *Front Floor Console Replacement on page 2-48*.	
1	Airbag Sensing and Diagnostic Module Fastener (Qty: 3) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 10 N•m (89 lb in)
2	Airbag Sensing and Diagnostic Module Assembly **Procedure** If installing a replacement module, program the module. Refer to *Control Module References on page 6-3*.

Steering Wheel Airbag Replacement

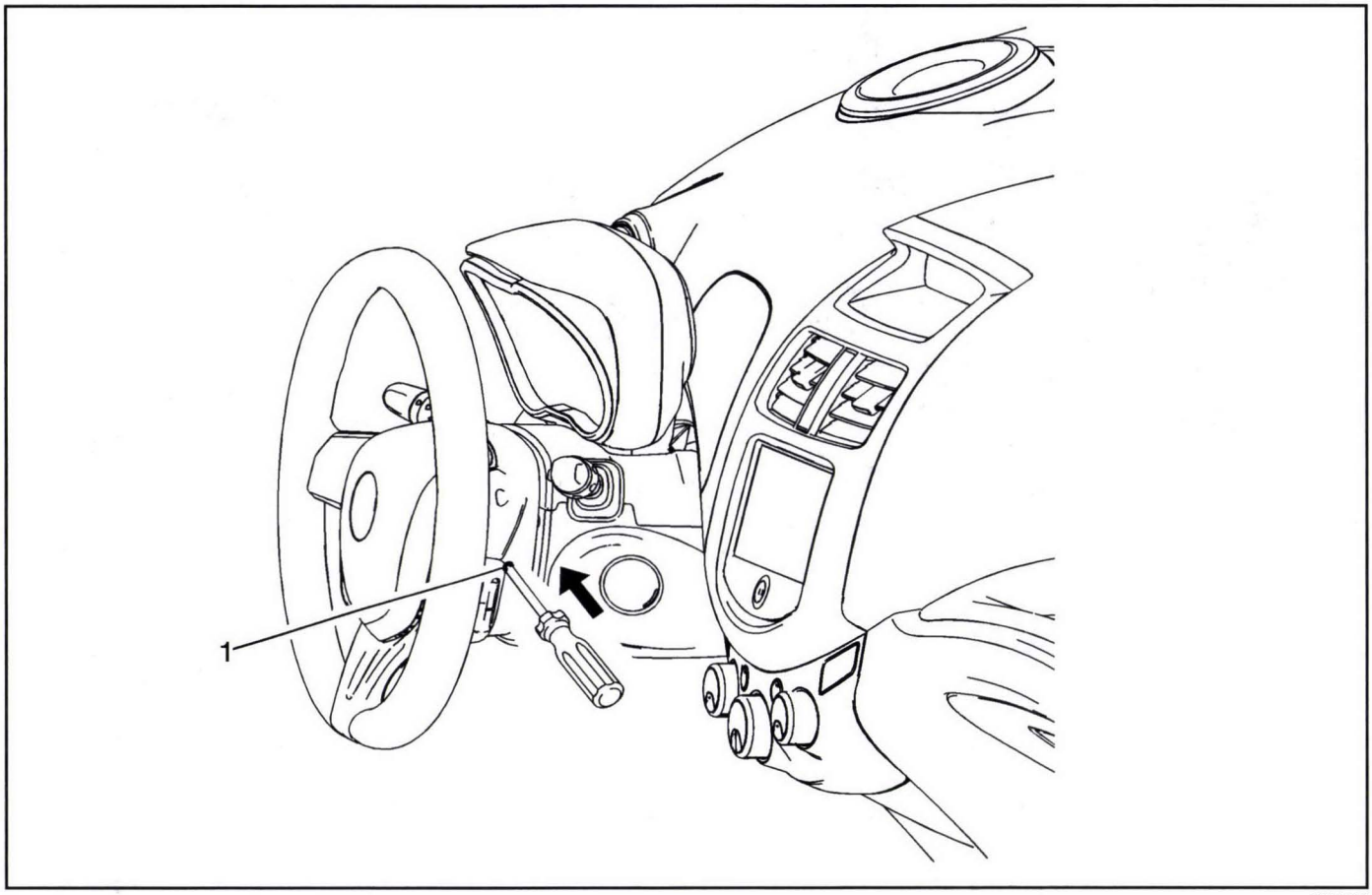
Removal Procedure

Warning: When carrying a live inflator module, make sure the bag opening is pointed away from you. This minimizes the chance of injury in the case of an accidental deployment. Never carry the inflator module by the wires. Never carry the inflator module by the connector on the underside of the module.

Make sure that the bag and trim cover are facing up whenever you place a live inflator module on any surface. This is necessary to provide a free space for the bag to expand in the unlikely event of accidental deployment.

Never rest the steering column assembly on the steering wheel with the inflator module face down, and the column vertical. This may result in personal injury.

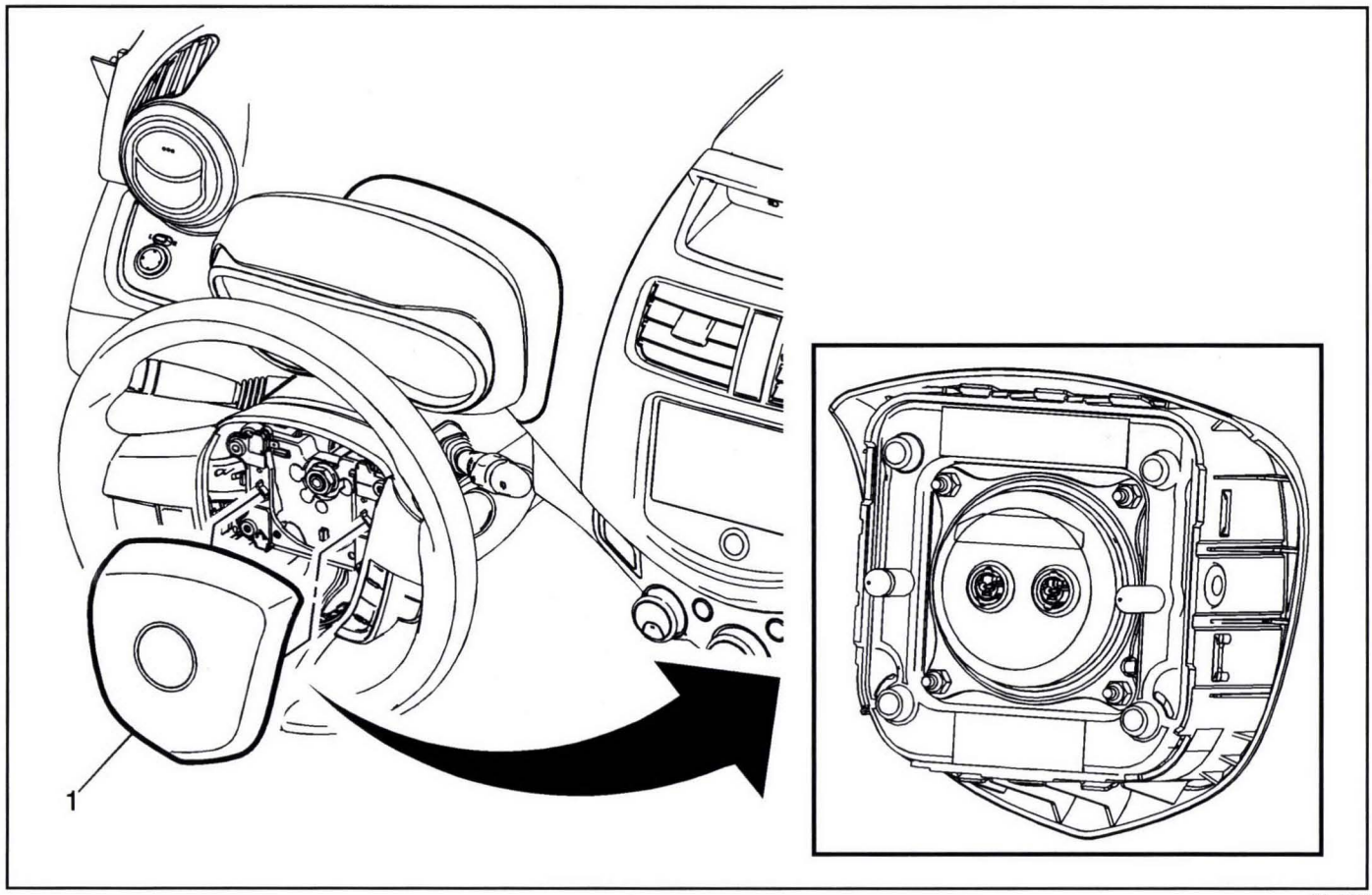
Warning: Refer to SIR Warning on page 0-7.



3211651

1. Disable the supplemental inflatable restraint (SIR) system. Refer to *SIR Disabling and Enabling on page 12-151*.
2. Using a blunt-ended tool, push the spring fastener inward through the access hole (1) located on both sides of the steering wheel.
3. Release the springs in direction of the arrows by pushing the tool horizontally.
4. Disconnect the electrical connectors.
5. Remove the steering wheel airbag module.

Installation Procedure



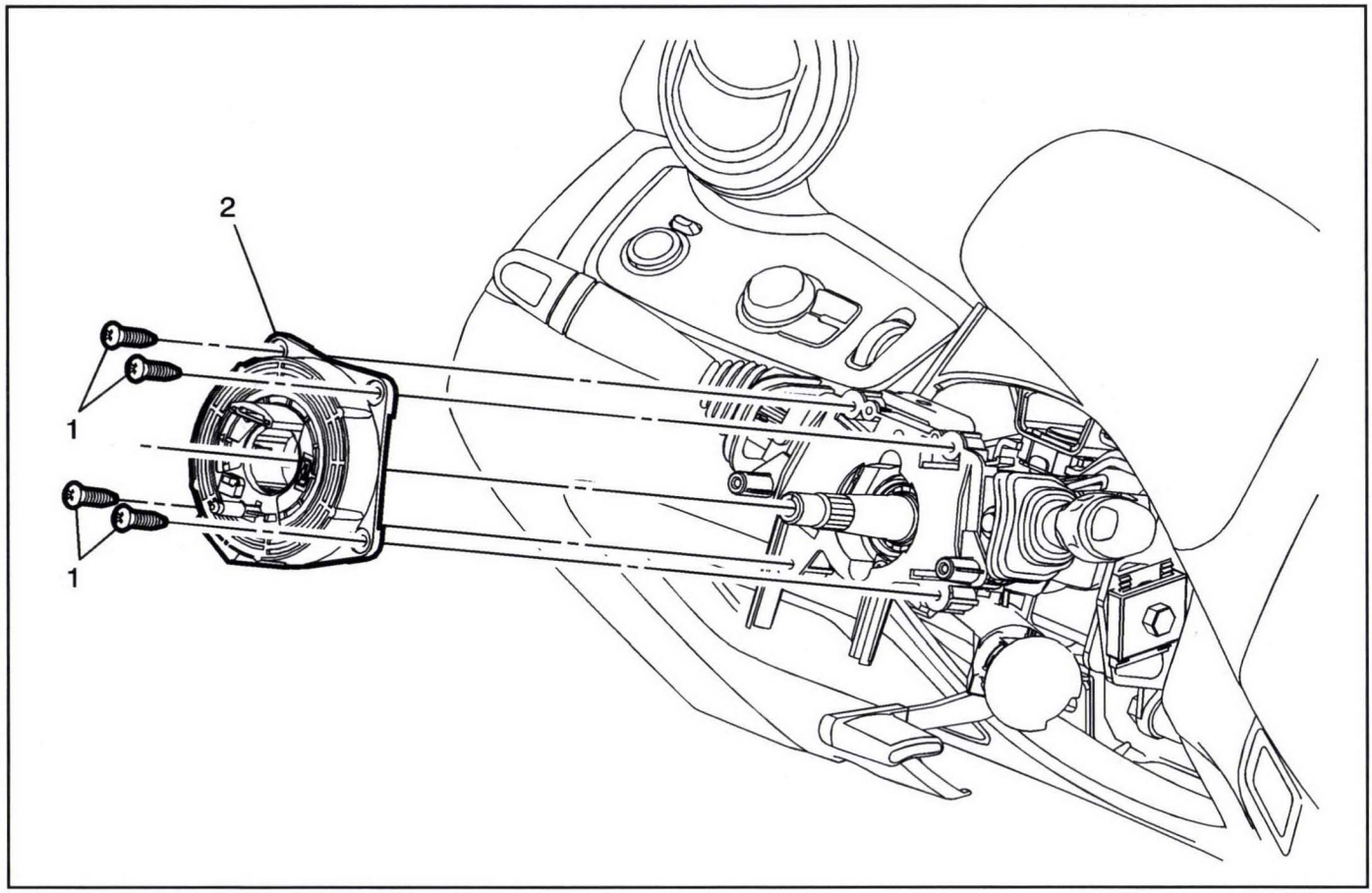
3211654

1. Connect the electrical connectors.
2. Align the steering wheel module fasteners to the steering column fastener holes.

Warning: After installation of the steering wheel airbag module to the steering wheel, slightly pull the module outward. If there is no give on the airbag module then it is secured correctly. If the airbag module is not fully attached personal injury could result.

3. Push the steering wheel module (1) firmly into the steering column in order the engage the fasteners.
4. Enable the SIR system. Refer to *SIR Disabling and Enabling on page 12-151*.
5. After replacing the module, fully deploy the old module before disposal.

Steering Wheel Airbag Coil Replacement



3125043

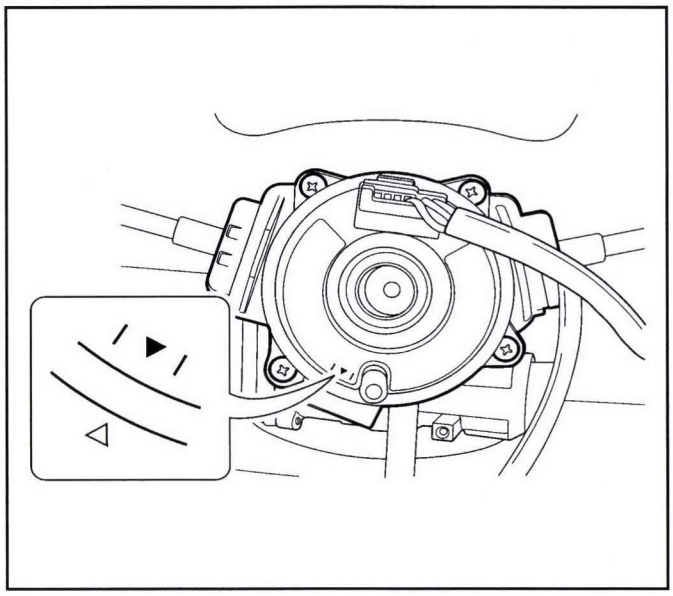
Steering Wheel Airbag Coil Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the steering wheel. Refer to *Steering Wheel Replacement on page 14-32*. 2. Remove the steering column upper trim cover. Refer to *Steering Column Upper Trim Cover Replacement on page 14-29*.	
1	Steering Wheel Airbag Coil Fastener (Qty: 4) **Caution:** Refer to *Fastener Caution on page 0-8*.
2	Steering Wheel Airbag 1. Disconnect any electrical connectors. 2. Ensure the coil is centered during installation. If installing a NEW coil, remove the centering tab AFTER the coil is on the steering column. Refer to *Airbag Steering Wheel Module Coil Centering on page 12-158*.

Airbag Steering Wheel Module Coil Centering

Caution: The new SIR coil assembly will be centered. Improper alignment of the SIR coil assembly may damage the unit, causing an inflatable restraint malfunction.

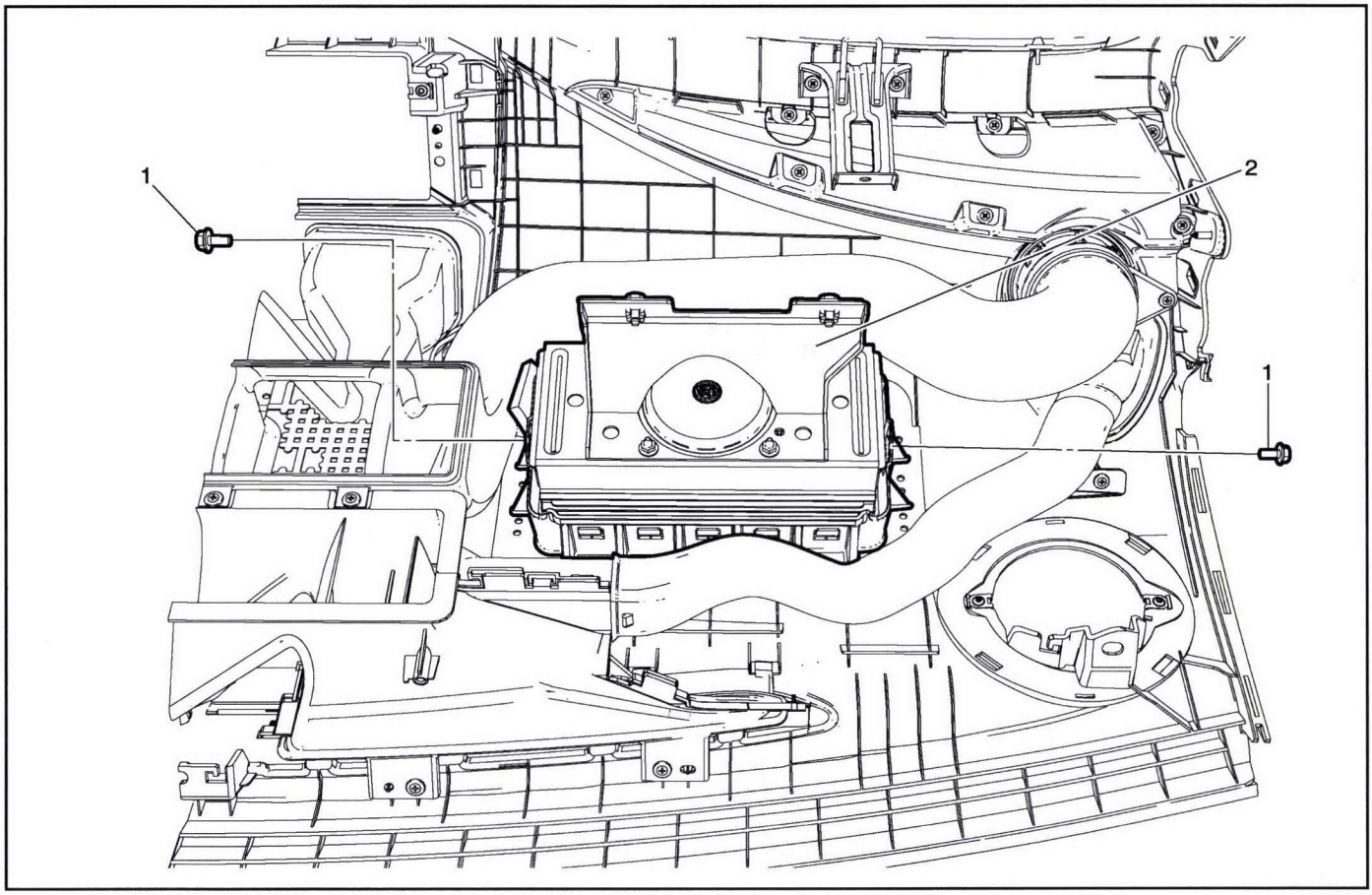
1. Verify that the wheels on the vehicle are straight ahead before centering the supplemental inflatable restraint (SIR) steering wheel module coil.
2. Turn the lobe of the clock spring clockwise until the coil ribbon stops. Do not force.
3. Turn the lobe of the clock spring counterclockwise approximately 3 turns to the neutral position.



2327290

4. Properly align until the arrows face each other. This indicates the CENTER position.

Instrument Panel Airbag Replacement

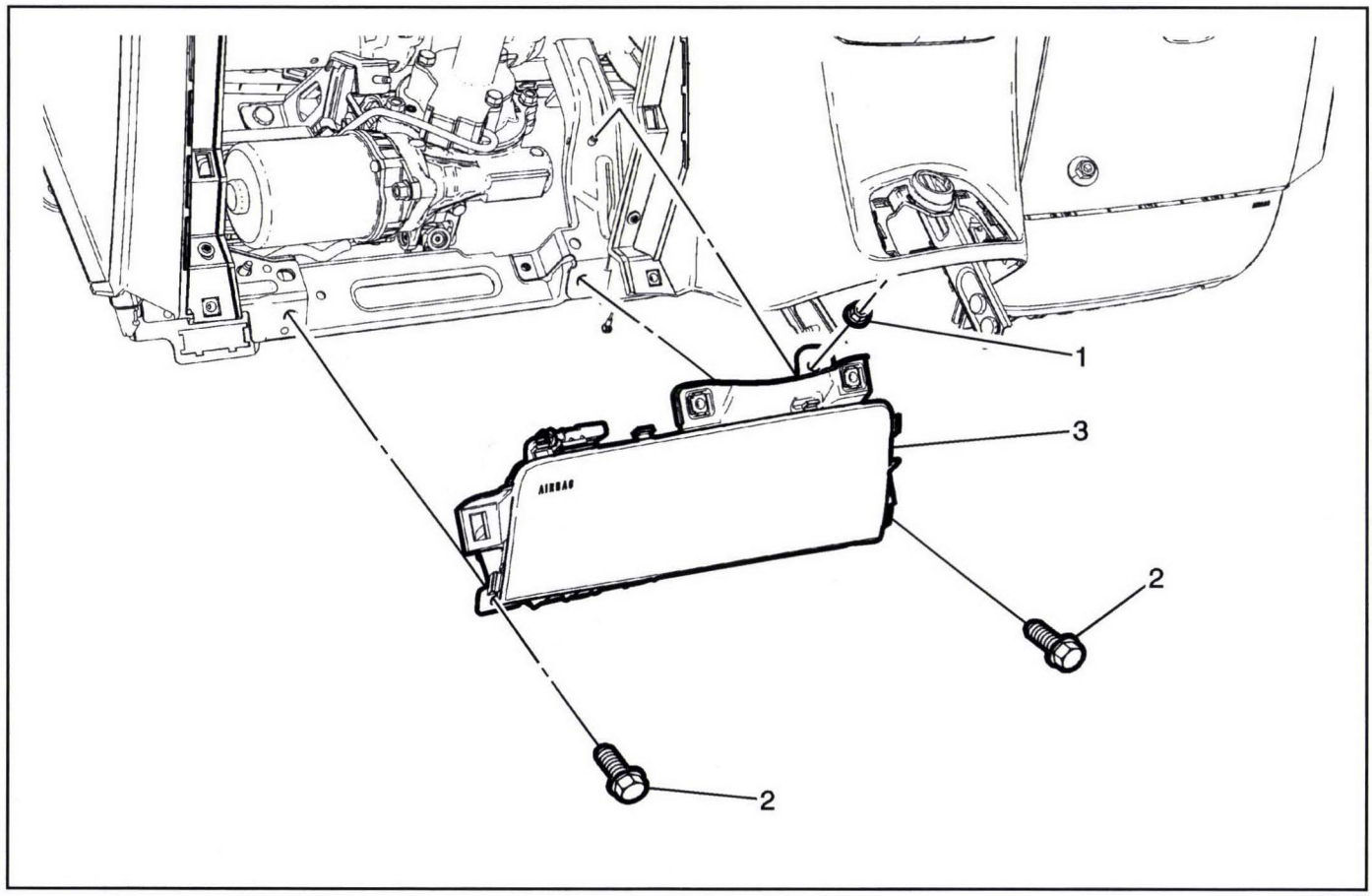


2327293

Instrument Panel Airbag Replacement

Callout	Component Name
Warning: Refer to SIR Warning on page 0-7.	
Preliminary Procedures 1. Disable the SIR system. Refer to *SIR Disabling and Enabling on page 12-151.* 2. Remove the instrument panel trim pad assembly. Refer to *Instrument Panel Trim Pad Replacement on page 2-31.*	
1	Instrument Panel Inflatable Restraint Module Fastener (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 10 N•m (89 lb in)
2	Instrument Panel Airbag Assembly **Procedure** Disconnect the electrical connectors.

Instrument Panel Lower Airbag Replacement - Driver Side



3398289

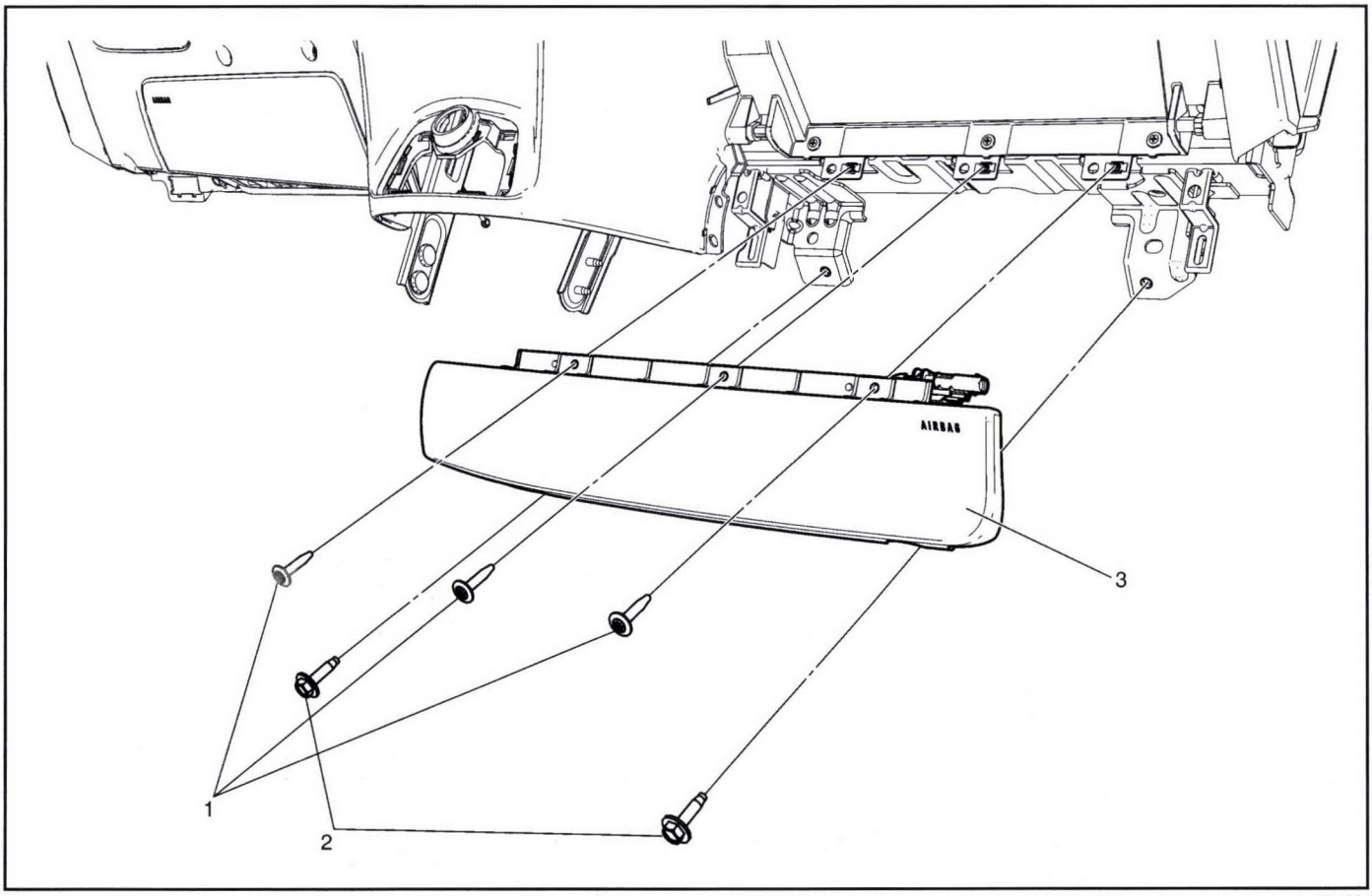
Instrument Panel Lower Airbag Replacement - Driver Side

Callout	Component Name
Warning: Refer to SIR Warning on page 0-7.	
Preliminary Procedures 1. Disable the SIR system. Refer to *SIR Disabling and Enabling on page 12-151.* 2. Remove the instrument panel knee bolster. Refer to *Instrument Panel Knee Bolster Replacement on page 2-22.*	

Instrument Panel Lower Airbag Replacement - Driver Side (cont'd)

Callout	Component Name
1	Inflatable Restraint Instrument Panel Lower Module Nut **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 10 N•m (89 lb in)
2	Inflatable Restraint Instrument Panel Lower Module Bolt (Qty: 2) **Tighten** 10 N•m (89 lb in)
3	Inflatable Restraint Instrument Panel Lower Module **Procedure** 1. Disconnect the electrical connector. 2. For proper handling and scrapping, refer to *Inflatable Restraint Module Handling and Scrapping on page 12-173.*

Instrument Panel Lower Airbag Replacement - Passenger Side



2754821

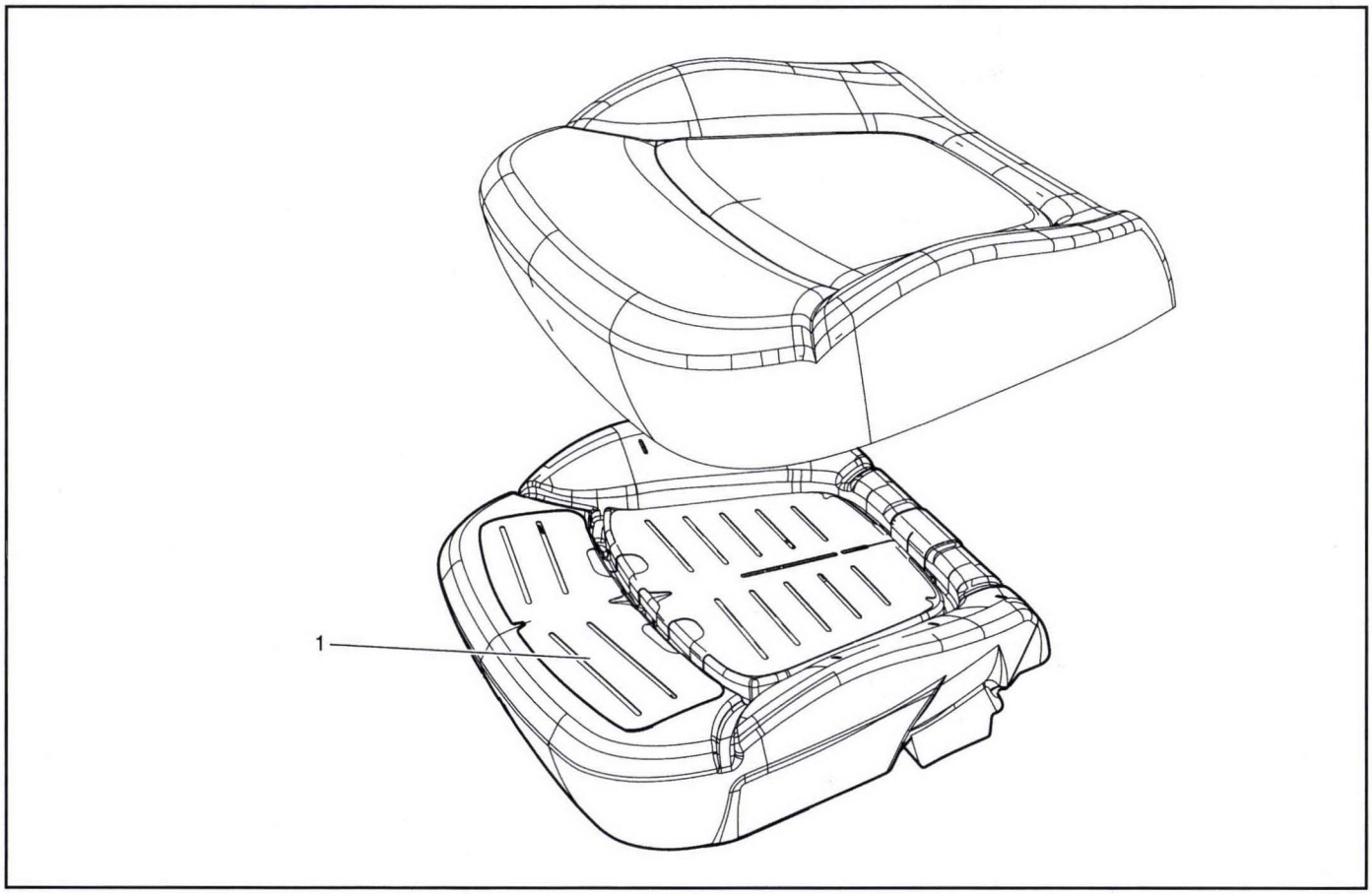
Instrument Panel Lower Airbag Replacement - Passenger Side

Callout	Component Name
	Warning: Refer to SIR Warning on page 0-7. **Preliminary Procedures** 1. Disable the SIR system. Refer to *SIR Disabling and Enabling on page 12-151.* 2. Remove the instrument panel compartment. Refer to *Instrument Panel Compartment Replacement on page 2-29.*
1	Inflatable Restraint Instrument Panel Lower Module Fastener (Qty: 3)

Instrument Panel Lower Airbag Replacement - Passenger Side (cont'd)

Callout	Component Name
2	Inflatable Restraint Instrument Panel Lower Module Fastener (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 10 N•m (89 lb in)
3	Inflatable Restraint Instrument Panel Lower Module **Procedure** 1. Disconnect the electrical connector. 2. For proper handling and scrapping, refer to *Inflatable Restraint Module Handling and Scrapping on page 12-173*.

Airbag Front Passenger Presence Module Replacement



2832984

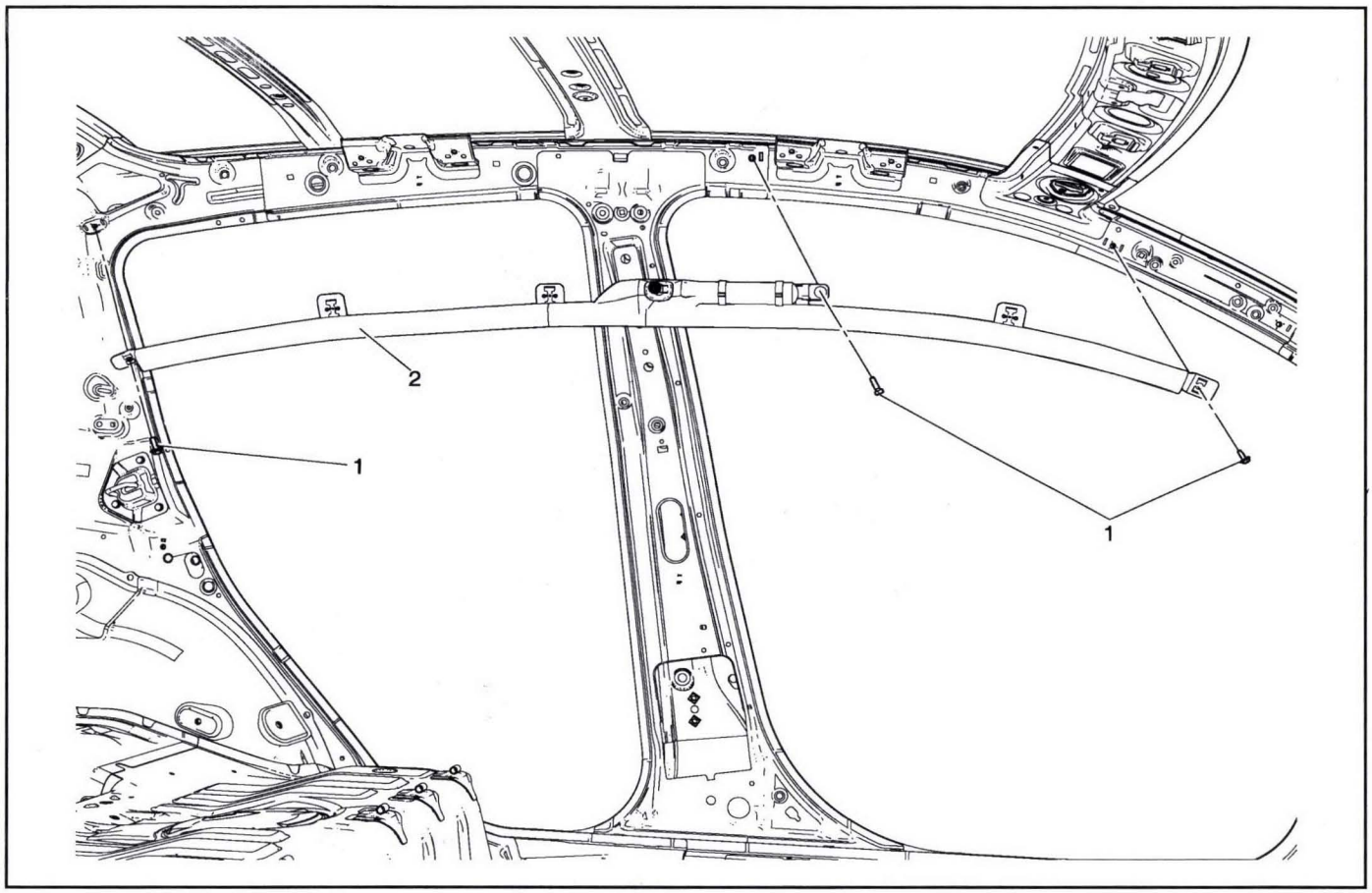
Airbag Front Passenger Presence Module Replacement

Callout	Component Name
	Warning: Refer to SIR Warning on page 0-7. ***Warning: Replace the passenger presence system as a complete assembly to prevent possible injury to the occupant. All the components in the service kit are assembled and calibrated as a unit. Using only some of the components in the service kit will cause the passenger presence system to operate improperly.*** **Preliminary Procedures** 1. Disable the supplemental inflatable restraint (SIR) system. Refer to *SIR Disabling and Enabling on page 12-151*. 2. Remove the seat cushion cover from the passenger seat. Refer to *Front Seat Cushion Cover and Pad Replacement on page 13-12*.

Airbag Front Passenger Presence Module Replacement (cont'd)

Callout	Component Name
1	Inflatable Restraint Front Passenger Presence Module **Procedure** 1. The inflatable restraint passenger presence module must be replaced as a service kit that also includes the seat cushion heating mat, pad and passenger presence sensor. 2. Re-zero the inflatable restraint passenger presence system whenever the seat cushion or any component of the passenger presence system is removed. Refer to *Passenger Presence System Rezeroing on page 12-147*.

Front and Rear Row Seat Roof Rail Airbag Replacement



2327291

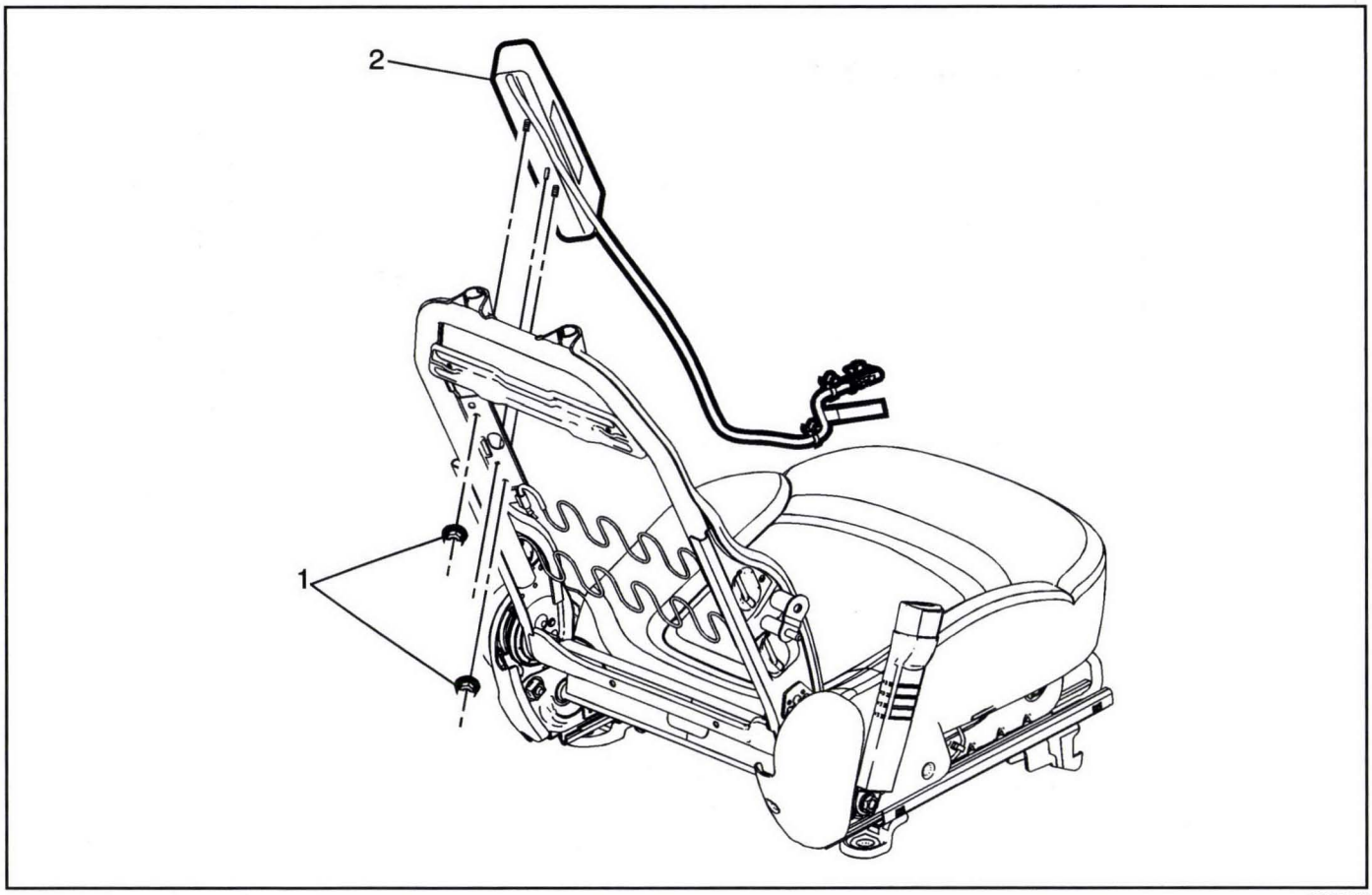
Front and Rear Row Seat Roof Rail Airbag Replacement

Callout	Component Name
	Warning: In order to prevent SIR deployment, personal injury, or unnecessary SIR system repairs, do not strike the door or the door pillar in the area of the side impact sensor (SIS). Turn OFF the ignition and remove the key when performing service in the area of the SIS. ***Warning: When performing service on or near the SIR components or the SIR wiring, the SIR system must be disabled. Refer to SIR Disabling and Enabling . Failure to observe the correct procedure could cause deployment of the SIR components, personal injury, or unnecessary SIR system repairs.*** **Preliminary Procedures** 1. Disable the SIR system. Refer to *SIR Disabling and Enabling on page 12-151*. 2. Remove the headliner. Refer to *Headlining Trim Panel Replacement on page 2-20*.
1	Front and Rear Row Seat Roof Rail Fastener (Qty: 3) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 10 N•m (89 lb in)

Front and Rear Row Seat Roof Rail Airbag Replacement (cont'd)

Callout	Component Name
2	Front and Rear Row Seat Roof Rail Airbag Assembly **Procedure** Disconnect the electrical connector.

Front Seat Outboard Seat Back Airbag Replacement



2969442

Front Seat Outboard Seat Back Airbag Replacement

Callout	Component Name

Warning: Refer to SIR Warning on page 0-7.

Warning: Following the deployment of a side impact air bag, inspect the following parts for damage. Replace these parts if necessary:

- ***The seat cushion frame***
- ***The seat recliner, if equipped***
- ***The seat adjuster***
- ***The seat back frame***

Failure to do so may cause future personal injury.

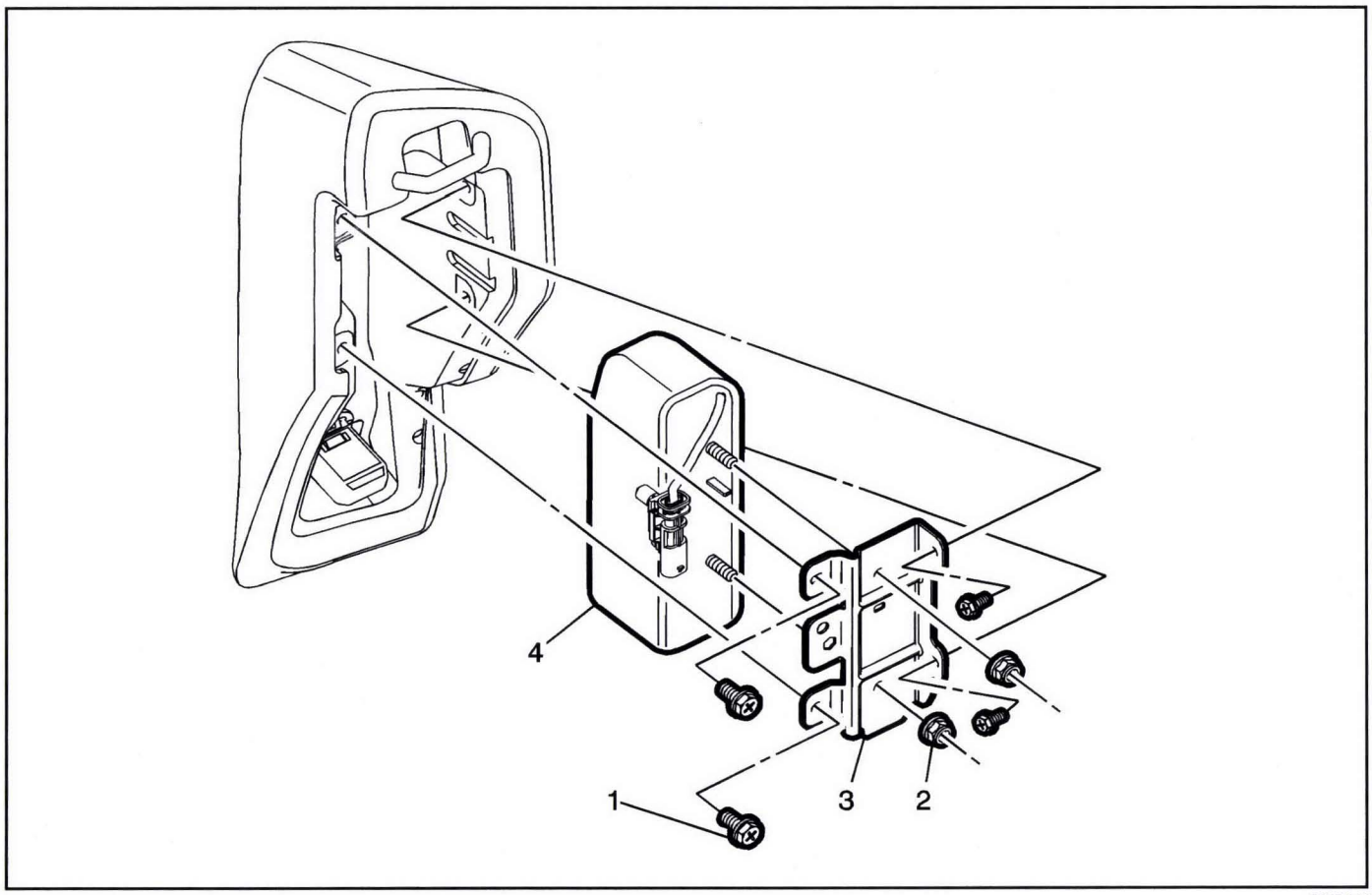
Preliminary Procedures

1. Disable the SIR system. Refer to *SIR Disabling and Enabling on page 12-151*.
2. Remove the driver or passenger seat back cover and pad. Refer to *Driver or Passenger Seat Back Cover and Pad Replacement on page 13-14*.

Front Seat Outboard Seat Back Airbag Replacement (cont'd)

Callout	Component Name
1	Front Seat Outboard Seat Back Airbag Nut (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 4 N•m (36 lb in)
2	Front Seat Outboard Seat Back Airbag Module Assembly **Procedures** 1. Remove the connector position assurance (CPA) from the module electrical connector. 2. Disconnect the electrical connector. 3. Refer to *Inflatable Restraint Module Handling and Scrapping on page 12-173*

Rear Seat Bolster Airbag Replacement



2969443

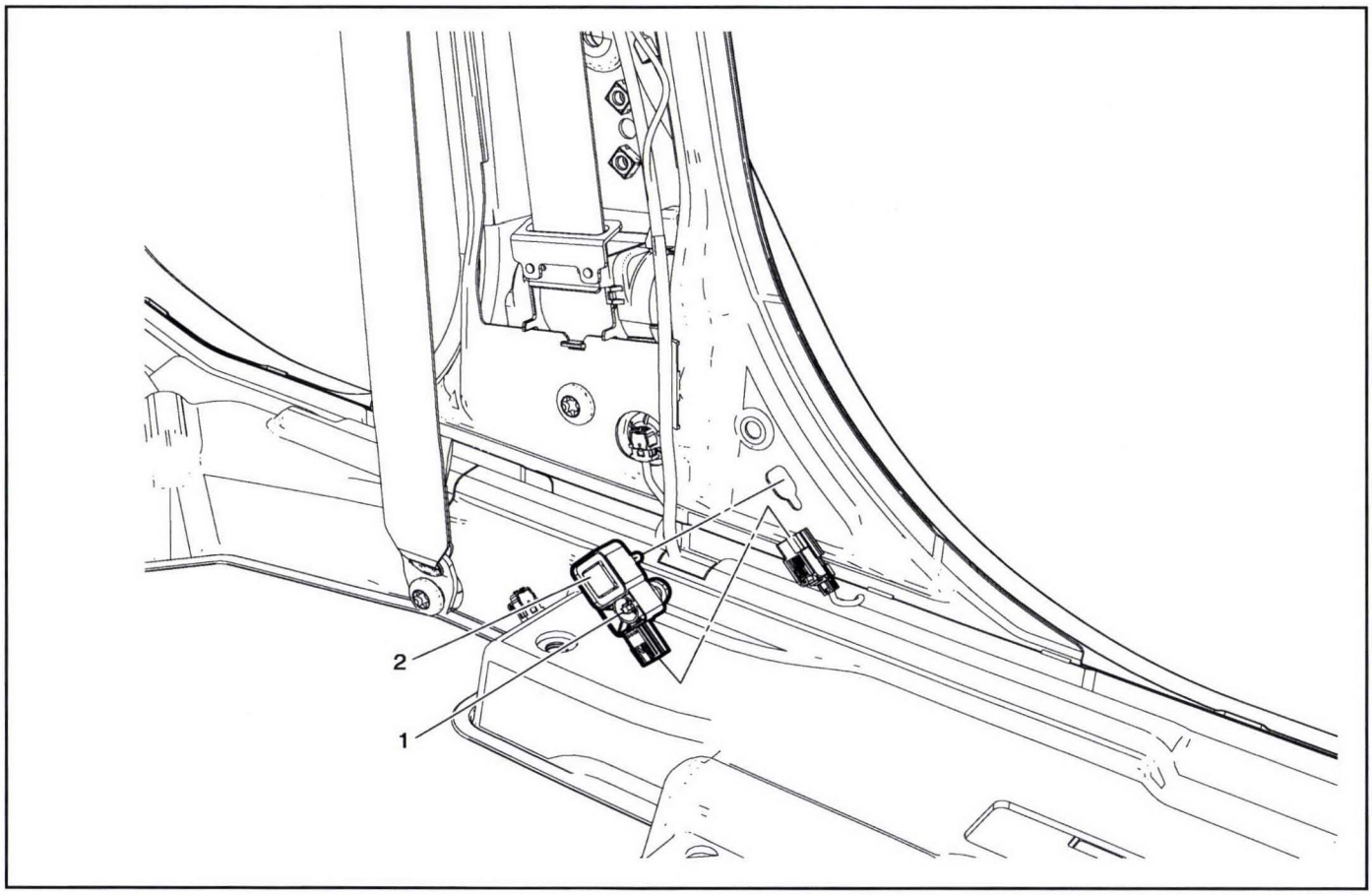
Rear Seat Bolster Airbag Replacement

Callout	Component Name
Preliminary Procedure 1. Disable the SIR system, if equipped. Refer to *SIR Disabling and Enabling on page 12-151*. 2. Remove the rear seat back cushion bolster. Refer to *Rear Seat Back Bolster Replacement on page 13-19*.	
1	Rear Seat Bolster Airbag Bolt (Qty: 4) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 3.5 N•m (31 lb in)

Rear Seat Bolster Airbag Replacement (cont'd)

Callout	Component Name
2	Rear Seat Bolster Airbag Nut (Qty: 2) **Tighten** 3.5 N•m (31 lb in)
3	Rear Seat Bolster Airbag Support Bracket
4	Rear Seat Bolster Airbag Module **Procedure** 1. Remove the connector position assurance (CPA) from the module electrical connector. 2. Disconnect the electrical connector.

Airbag Side Impact Center Pillar Sensor Replacement

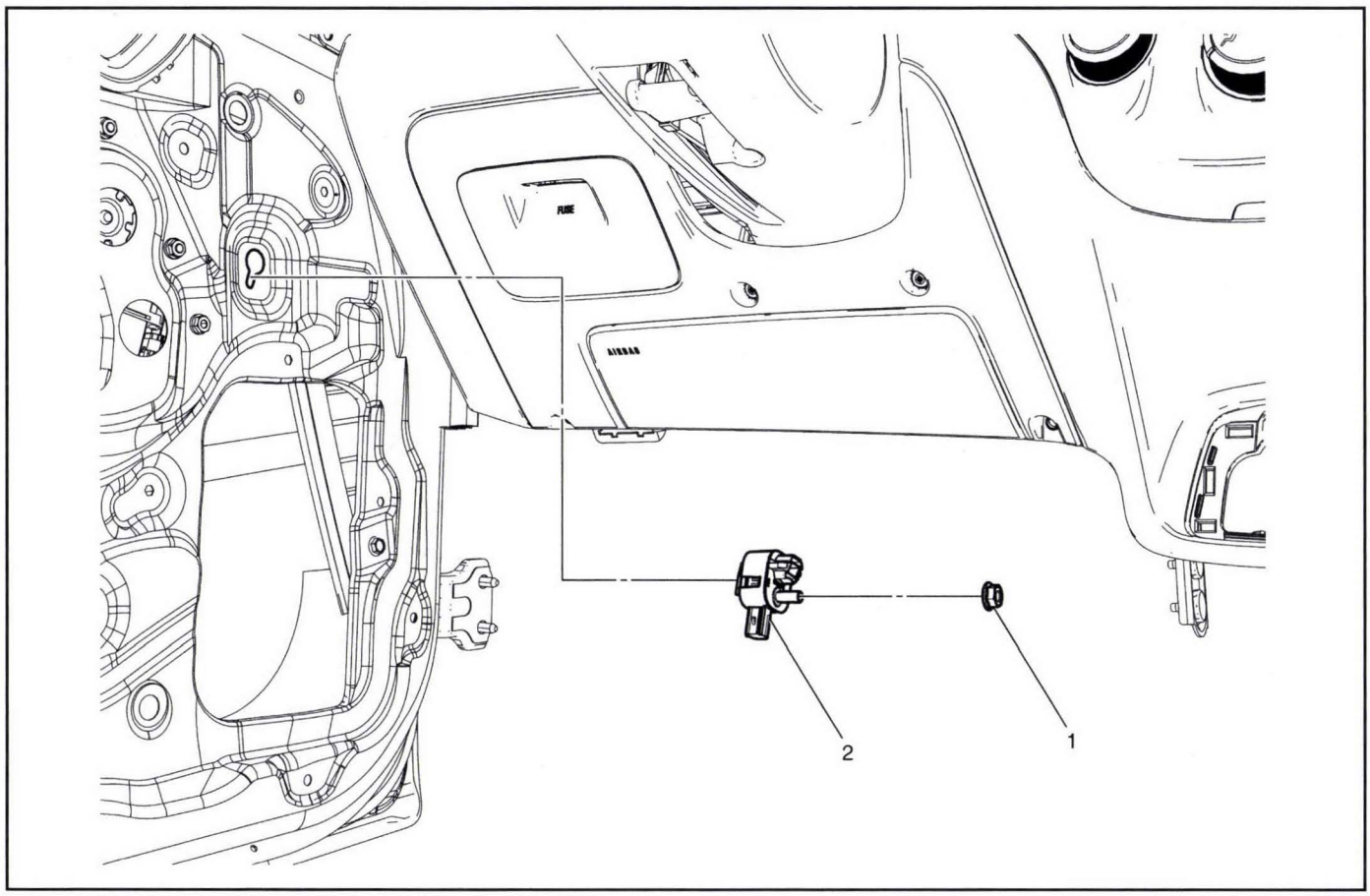


2327298

Airbag Side Impact Center Pillar Sensor Replacement

Callout	Component Name
	Warning: Refer to SIR Warning on page 0-7. ***Warning: Refer to SIR Inflator Module Handling and Storage Warning on page 0-6.*** ***Warning: Following the deployment of a side impact air bag, inspect the following parts for damage. Replace these parts if necessary:*** • ***The seat cushion frame*** • ***The seat recliner, if equipped*** • ***The seat adjuster*** • ***The seat back frame*** ***Failure to do so may cause future personal injury.*** **Preliminary Procedure** 1. Disable the SIR system. Refer to *SIR Disabling and Enabling on page 12-151* 2. Remove center pillar lower garnish molding. Refer to *Center Pillar Lower Trim Panel Replacement on page 2-63*.
1	Inflatable Restraint Side Impact Sensor Screw **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 7.5 N•m (66 lb in)
2	Inflatable Restraint Side Impact Sensor Assembly **Procedure** 1. Disconnect electrical connector. 2. Loosen the bolts and slide the sensor out of the keyhole slots. **Tip:** The bolt is integral to the sensor assembly, DO NOT remove separately.

Airbag Side Impact Sensor Replacement - Front Side Door

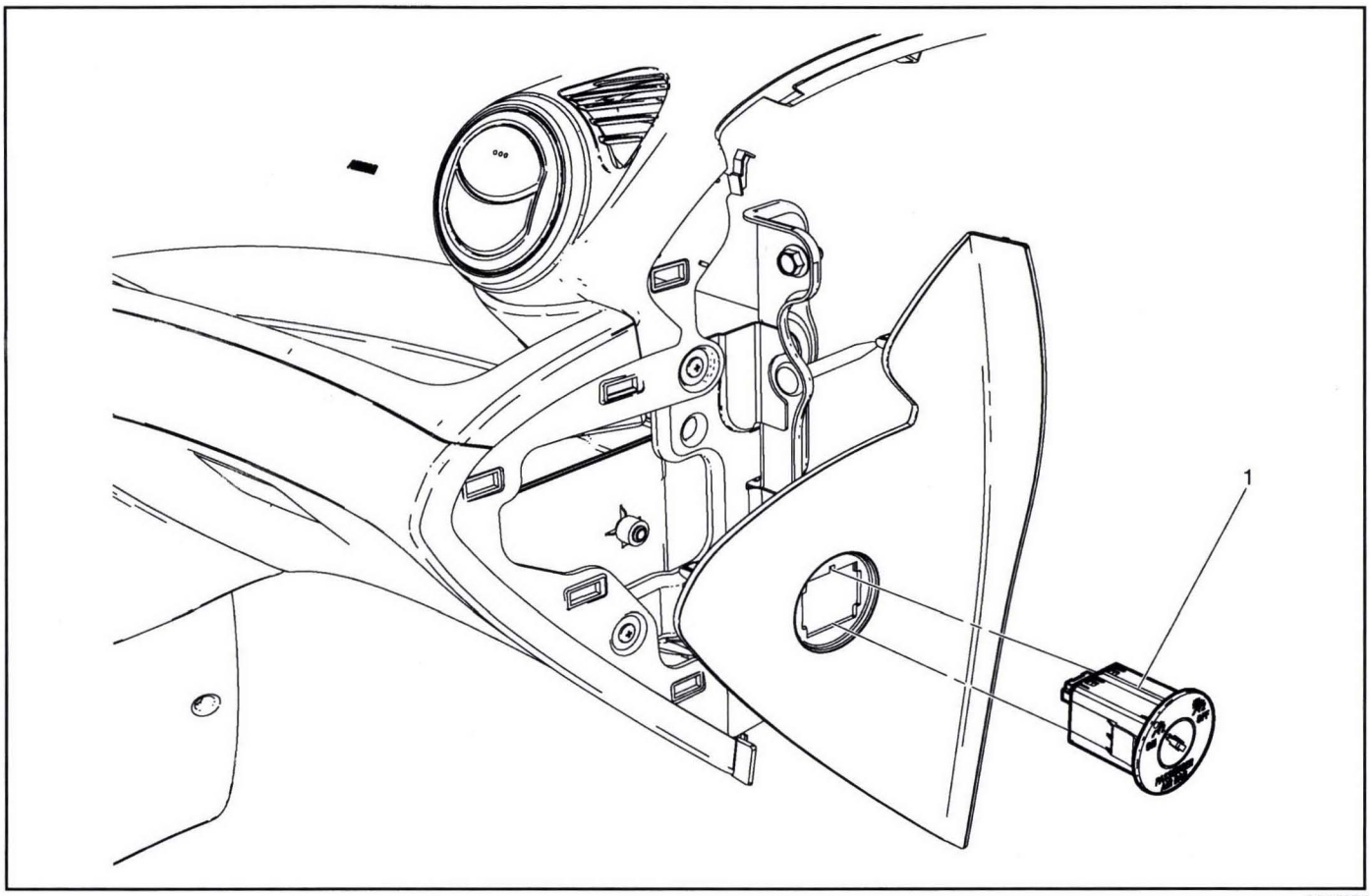


2775364

Airbag Side Impact Sensor Replacement - Front Side Door

Callout	Component Name
Warning: Refer to SIR Warning on page 0-7. ***Warning: Refer to SIR Inflator Module Handling and Storage Warning on page 0-6.*** ***Warning: Following the deployment of a side impact air bag, inspect the following parts for damage. Replace these parts if necessary:*** • ***The seat cushion frame*** • ***The seat recliner, if equipped*** • ***The seat adjuster*** • ***The seat back frame*** ***Failure to do so may cause future personal injury.*** **Preliminary Procedures** 1. Disable the SIR system. Refer to *SIR Disabling and Enabling on page 12-151*. 2. Remove front side door trim. Refer to *Front Side Door Trim Replacement on page 2-53*. 3. For access to sensor, detach the water deflector partly from front of door.	
1	Inflatable Restraint Side Impact Sensor Nut **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 7.5 N•m (66 lb in)
2	Inflatable Restraint Side Impact Sensor Assembly **Procedure** 1. Remove the sensor out of the door panel. 2. Disconnect electrical connector.

Inflatable Restraint Instrument Panel Compartment Module Disable Switch Replacement

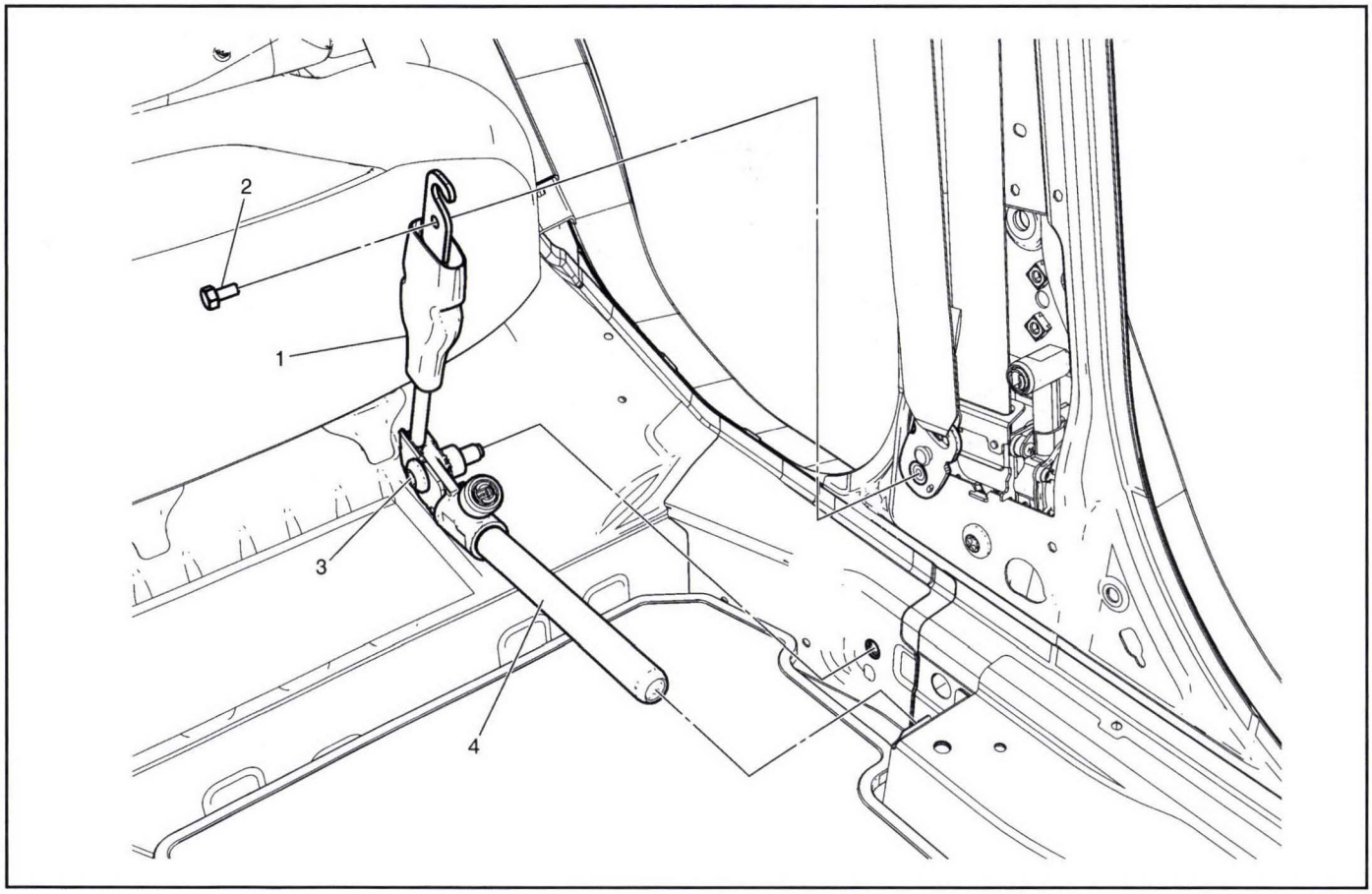


2356875

Inflatable Restraint Instrument Panel Compartment Module Disable Switch Replacement

Callout	Component Name
Preliminary Procedure Remove the instrument panel outer trim cover of passenger side. Refer to *Instrument Panel Outer Trim Cover Replacement on page 2-28*.	
1	Inflatable Restraint Instrument Panel Compartment Module Disable Switch **Procedure** 1. Use a small flat bladed tool to aid in the removal of the passenger airbag disable switch from the instrument panel outer trim cover. 2. Disconnect the electrical connector.

Front Seat Belt Anchor Plate Tensioner Replacement

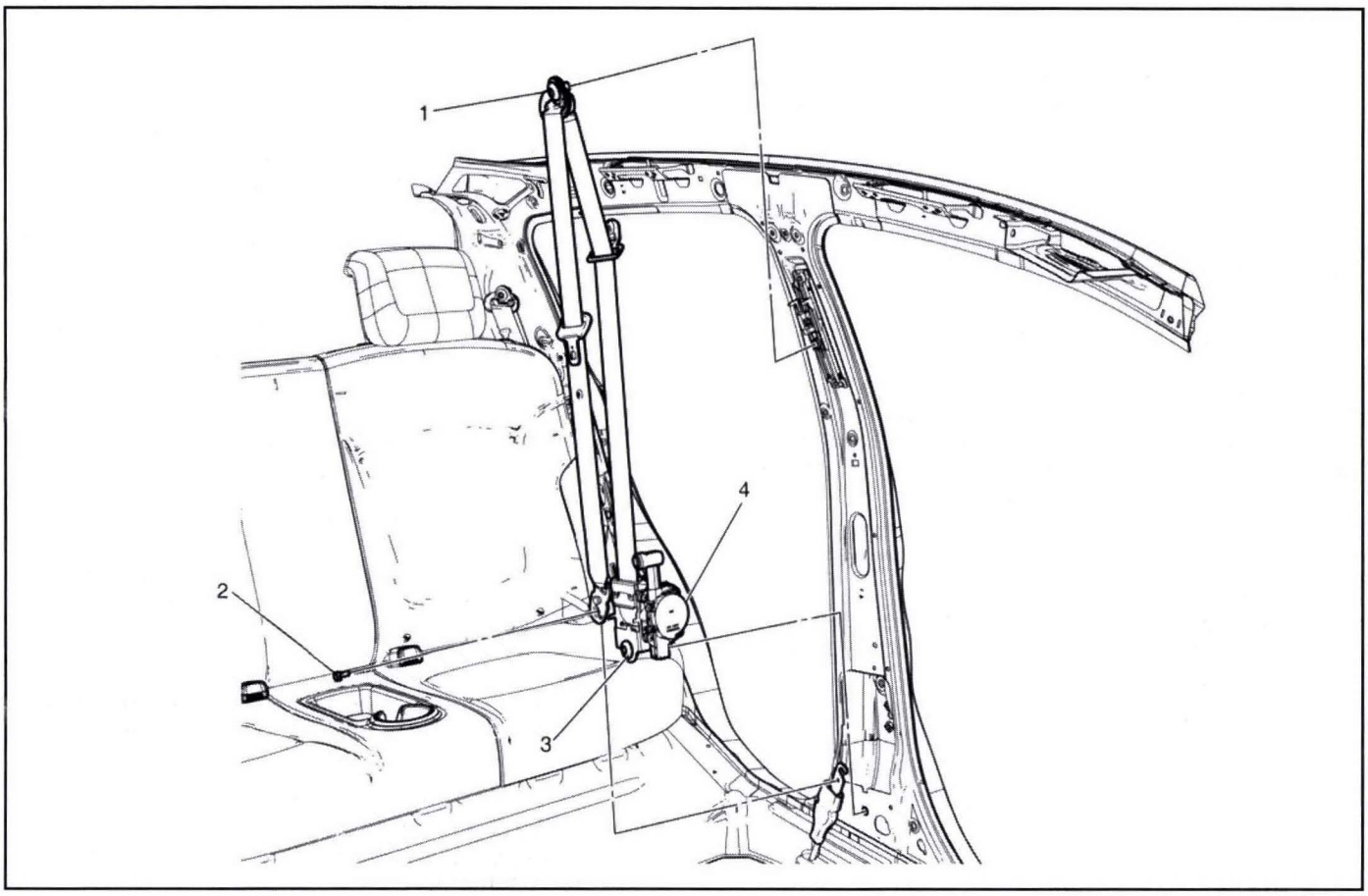


2754823

Front Seat Belt Anchor Plate Tensioner Replacement

Callout	Component Name
Warning: Refer to SIR Seatbelt Pretensioner Handling Warning on page 0-6.	
Preliminary Procedures 1. Remove the center pillar lower trim panel. Refer to *Center Pillar Lower Trim Panel Replacement on page 2-63*. 2. Remove the rear side door sill garnish molding. Refer to *Rear Side Door Sill Garnish Molding Replacement on page 2-58*.	
1	Front Seat Belt Tensioner Cover **Procedure** Lower the seat belt tensioner cover.
2	Front Seat Belt Tensioner Anchor Bolt **Caution:** Refer to *Fastener Caution on page 0-8* **Tighten** 5 N•m (44 lb in)
3	Front Seat Belt Anchor Plate Tensioner Fastener **Tighten** 40 N•m (30 lb ft)
4	Front Seat Belt Anchor Plate Tensioner **Procedure** Disconnect the electrical connector.

Driver or Passenger Seat Retractor Side Belt Replacement



2754824

Driver or Passenger Seat Retractor Side Belt Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the center pillar upper trim panel. Refer to *Center Pillar Upper Trim Panel Replacement on page 2-62*. 2. Remove the center pillar lower trim panel. Refer to *Center Pillar Lower Trim Panel Replacement on page 2-63*.	
1	Front Seat Belt Upper Anchor Bolt **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 40 N•m (30 lb ft)
2	Front Seat Belt Lower Anchor Bolt **Procedure** 1. Lower the seat belt tensioner cover for bolt removal. 2. Remove the anchor bolt. **Tighten** 40 N•m (30 lb ft)
3	Front Seat Belt Retractor Bolt **Tighten** 40 N•m (30 lb ft)
4	Front Seat Belt Assembly **Procedure** 1. Disconnect the pretensioner connector from the retractor. 2. Remove the retractor from the body panel.

Repairs and Inspections Required After a Collision

Accident With or Without Air Bag Deployment – Component Inspections

Warning: Proper operation of the Supplemental Inflatable Restraint (SIR) sensing system requires that any repairs to the vehicle structure return the vehicle structure to the original production configuration. Not properly repairing the vehicle structure could cause non-deployment of the air bag(s) in a frontal collision or deployment of the air bag(s) for conditions less severe than intended.

After any collision, inspect the following components as indicated. If you detect any damage, replace the component. If you detect any damage to the mounting points or mounting hardware, repair the component or replace the hardware as needed.

- The high voltage system—Inspect the high voltage system. Refer to *High Voltage System Inspection on page 9-441*.
- The steering column—Inspect the steering column for bending, twisting, buckling or any type of damage.
- The instrument panel knee bolsters and mounting points—Inspect the knee bolsters for bending, twisting, buckling, or any other type of damage.
- The instrument panel brackets, braces, etc.—Inspect for bending, twisting, buckling, or any other type of damage.
- The seat belts—Perform the seat belt operational and functional checks. Refer to *Repairs and Inspections Required After a Collision on page 12-93*.
- The instrument panel cross car beam—Inspect for bending, twisting, buckling, or any other type of damage.
- The instrument panel mounting points and brackets—Inspect for bending, twisting, buckling, or any other type of damage.
- The seats and seat mounting points—Inspect for bending, twisting, buckling, or any other type of damage.
- The roof and headliner mounting points.
- The brake pedal –Inspect the brake pedal for bending, twisting, buckling or any type of damage.

Accident With Frontal Air Bag Deployment – Component Replacement and Inspections

After a collision involving air bag deployment, replace the following components.

- Driver steering wheel air bag
- Passenger instrument panel air bag, if deployed
- Inflatable Restraint Sensing and Diagnostic Module (SDM), if the Inflatable Restraint Sensing and Diagnostic Module has set DTC B0052 and will not clear
- Front and/or side impact sensors
- Driver/Passenger seat side air bag, if deployed
- Seat back cover if side seat air bag is deployed
- Driver/Passenger seat belt anchor and/or retractor pretensioners

Perform additional inspections on the following components.

- Steering wheel air bag coil and the coil wiring pigtail—Inspect for melting, scorching, or other damage due to excessive heat.
- Mounting points or mounting hardware for the passenger instrument panel air bag, steering wheel air bag, SDM, seat side air bag (if deployed) and seat belt anchor and/or retractor pretensioners—Inspect for any damage and repair or replace each component as needed.

Accident With Side Seat Air Bag Deployment – Component Replacement and Inspections

After a collision involving driver/passenger side seat air bag deployment, replace the following components.

- Left/right side impact sensors on the side of the impact.
- Left/right roof rail air bag on the side of the impact.
- Inflatable Restraint Sensing and Diagnostic Module (SDM), if the Inflatable Restraint Sensing and Diagnostic Module has set DTC B0052 and will not clear
- Inflatable restraint seat belt anchor and/or retractor pretensioner.
- Driver or passenger seat back cushion cover replacement.

Warning: Do not repair or replace the seat stitching or seams in the seat back trim cover with an internal mounted seat side airbag module. Replace the complete seat back trim cover from the OEM. Non-OEM seat stitching may cause improper airbag deployment which could result in personal injury.

Perform additional inspections on the following components.

- Mounting points or mounting hardware for the side impact sensors, and driver/passenger side seat air bags on the side of impact—Inspect for any damage and repair or replace each component as needed.
- Mounting points, mounting hardware, headliner and trim pieces for the left/right roof rail air bag on the side of impact—Inspect for any damage and repair or replace each component as needed.
- Mounting points or mounting hardware for the SDM and seat belt anchor and/or retractor pretensioners—Inspect for any damage and repair or replace each component as needed.
- The seat cushion frame
- The seat recliner and cover, if equipped
- The seat adjuster
- The seat back frame
- Door trim assembly
- Impacted seat cushion side covers and switches

Impact Sensor Replacement Guidelines

The impact sensor replacement policy requires replacing sensors in the area of the accident damage. The area of accident damage is defined as the portion of the vehicle which is crushed, bent, or damaged due to a collision. An example of this would be a moderate collision where the front of the vehicle impacts a object. If the vehicle has an impact sensor mounted forward of the radiator, it must be replaced.

- Replace the impact sensor whether or not the air bags have deployed.
- Replace the impact sensor even if it appears to be undamaged.

Impact sensor damage which is not visible, such as slight bending of the mounting bracket or cuts in the wire insulation, can cause improper operation of the SIR system. Do not try to determine whether the impact sensor is undamaged, replace the impact sensor. Also, if you follow a diagnostic trouble code (DTC) procedure and a malfunctioning impact sensor is indicated, replace the impact sensor.

Inflatable Restraint Module Handling and Scrapping

Special Tools

- *EL-38826* SIR Deployment Harness
- *EL-39401-B* SIR Deployment Fixture

For equivalent regional tools, refer to *Special Tools on page 12-184*.

Live and Undeployed Air Bag

Warning: Refer to SIR Inflator Module Handling and Storage Warning on page 0-6.

Take special care when handling or storing an undeployed air bag. An air bag deployment produces a rapid generation of gas. This may cause the air bag, or an object in front of the air bag, to project through the air in the event of an unlikely deployment.

Dual Stage Air Bags

Dual stage air bags have two deployment stages. If stage 1 was used to deploy a dual stage air bag, stage 2 may still be active. Therefore, a deployed dual stage air bag must be treated as an active air bag. If disposal of a dual stage air bag is required, both deployment loops must be energized to deploy the air bag.

Scrapping Procedure

During the course of a vehicle's useful life, certain situations may arise which will require the disposal of a live and undeployed air bag. Do NOT dispose a live and undeployed air bag through normal disposal channels until the air bag has been deployed.

Do not deploy the air bag in the following situations:

- After replacement of an air bag under warranty— the air bag may need to be returned undeployed to the manufacturer.
- If the vehicle is the subject of a product liability claim, related to the SIR system and is subject to a preliminary investigation — do NOT alter the SIR system in any manner.
- If the vehicle is involved in a campaign affecting the air bags — follow the instructions in the campaign service bulletin for proper SIR handling procedures.

Deployment Procedures

Note: Some countries, states or localities may not allow service deployment of air bags without special permission or training. Local laws regarding deploying and scrapping of air bags/devices with pyrotechnics must be followed.

You can deploy the air bag either inside or outside of the vehicle. The method used depends upon the final disposition of the vehicle. Review the following procedures in order to determine which will work best in a given situation:

Deployment Outside Vehicle – Steering Wheel Air Bag, Instrument Panel Air Bag, and Roof Rail Air Bag

Deploy the air bag outside of the vehicle when the vehicle will be returned to service. Situations that require deployment outside of the vehicle include the following:

- Using the SIR diagnostics, you determine that the air bag is malfunctioning.
- The air bag is cosmetically damaged, scratched, or ripped.
- The air bag pigtail is damaged.
- The air bag connector is damaged.
- The air bag connector terminals are damaged.

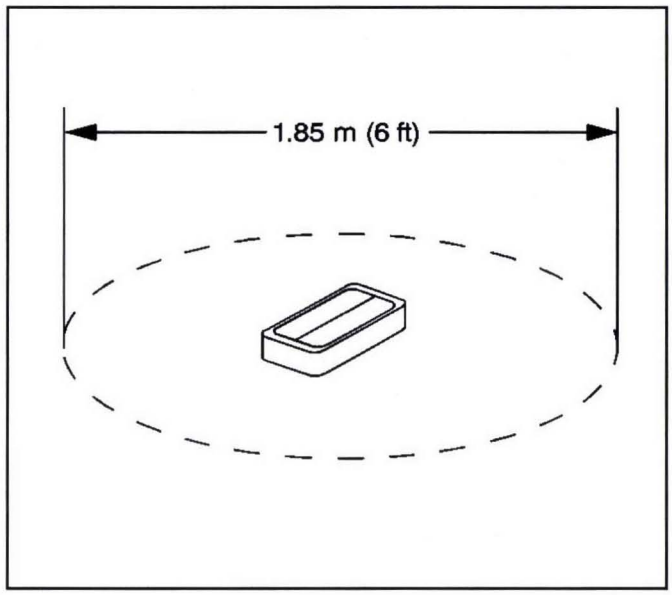
Deployment and disposal of a malfunctioning air bag is subject to any required retention period.

Warning: Refer to SIR Inflator Module Disposal Warning on page 0-6.

1. Vehicle OFF.

Warning: Refer to SIR Inflator Module Handling and Storage Warning on page 0-6.

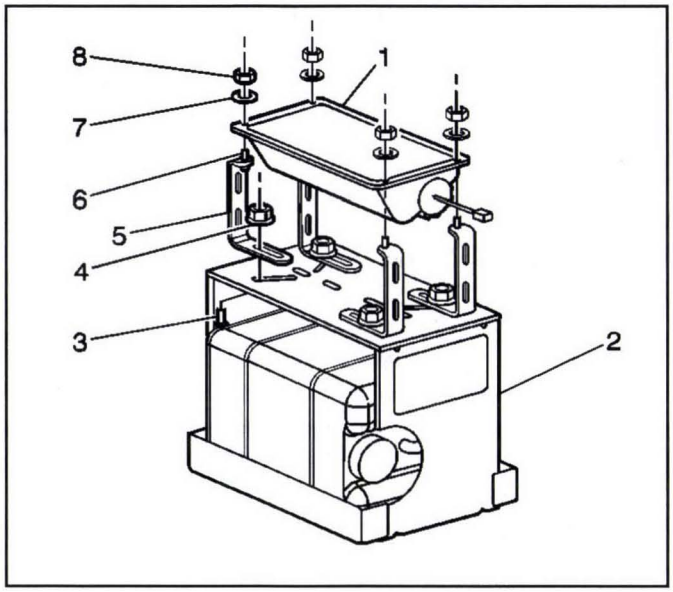
2. Remove the air bag.



68646

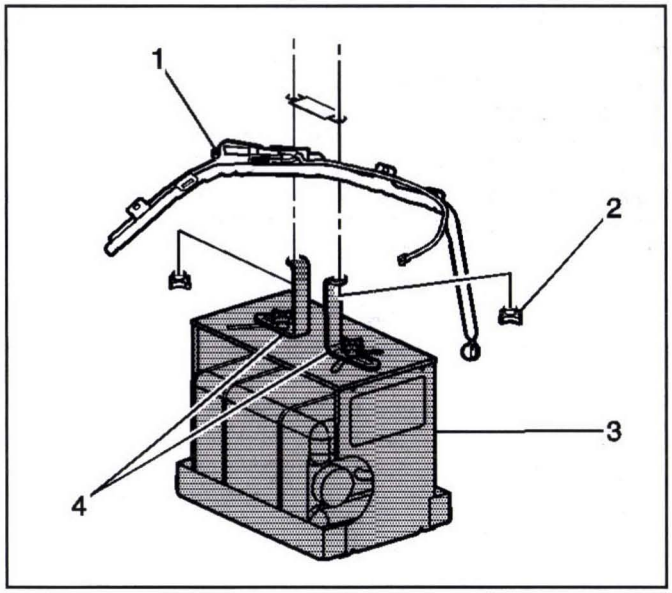
3. Clear a space on the ground about 1.85 m (6 ft) in diameter for deployment of the air bag or deployment fixture. If possible, use a paved, outdoor location free of activity. Otherwise, use a space free of activity on the shop floor. Ensure you have sufficient ventilation.
4. Clear the area of loose or flammable objects.

   Note: Dual stage deployments are only used in steering wheel and instrument panel air bags. If stage 1 was used to deploy a dual stage air bag, stage 2 may still be active. If disposal of a dual stage air bag is required, both deployment loops must be energized to deploy the air bag.
5. If you are deploying a steering wheel air bag, place the air bag in the center of the space with the vinyl trim cover facing up and away from the surface.



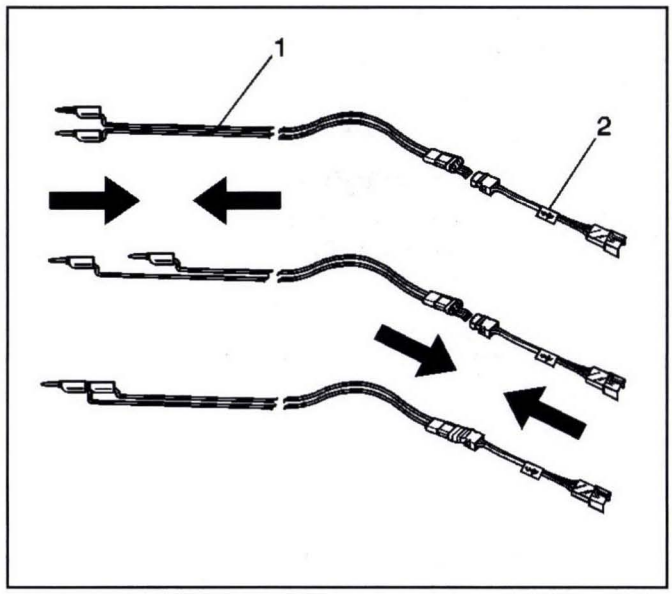
453892

6. When deploying an instrument panel air bag, perform the following instructions:
   6.1. Place the *EL-39401-B* fixture in the center of the cleared area.
   6.2. Fill the deployment fixture with water or sand.
   6.3. Using the proper nuts and bolts, mount the instrument panel air bag (1) to the deployment fixture (2), with the vinyl trim facing up.
   6.4. Securely tighten all fasteners that hold the instrument panel air bag (1) to the deployment fixture (2).



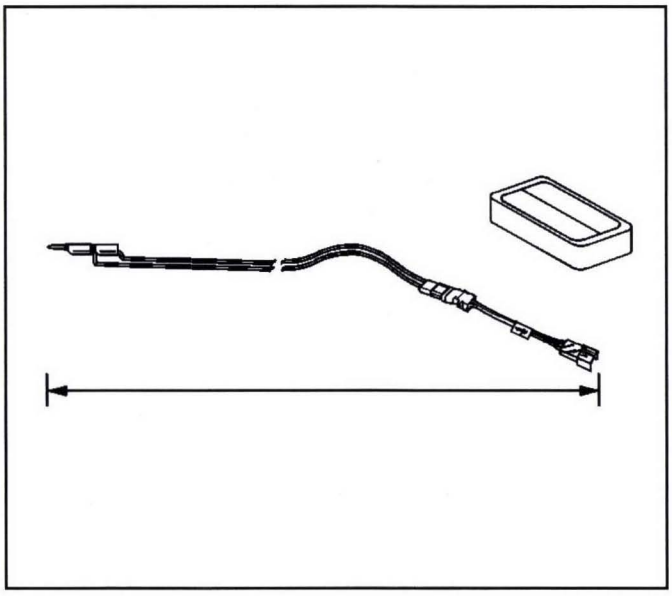
816848

7. When deploying a roof rail air bag, perform the following instructions:
   7.1. Place the *EL-39401-B* fixture (3) in the center of the cleared area.
   7.2. Fill the deployment fixture with water or sand to provide sufficient stabilization of fixture during deployment.
   7.3. Adjust and secure the fixture arms (4) to the deployment fixture (3), using the proper nuts and bolts.
   7.4. Attach the roof rail air bag in the deployment fixture and securely tighten all fasteners.



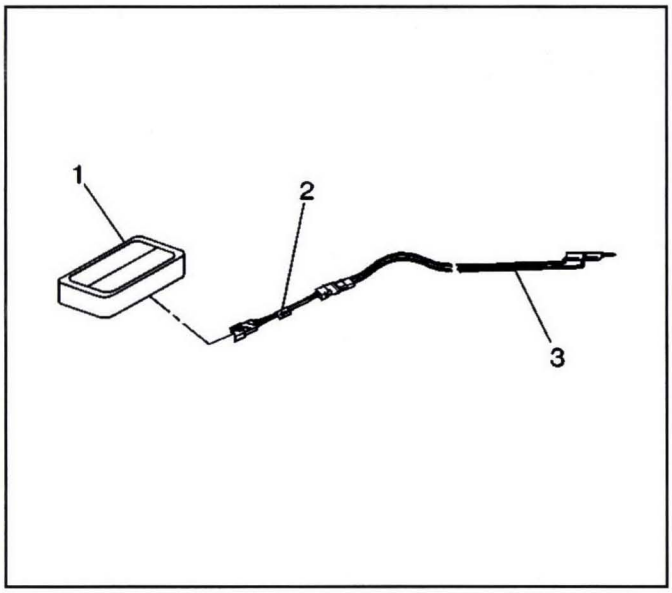
68645

8. Inspect the *EL-38826* harness and the appropriate pigtail adapter (2) for damage. Replace as needed.
9. Short the 2 SIR deployment harness leads (1) together using one banana plug seated into the other.
10. Connect the appropriate pigtail adapter (2) to the SIR deployment harness (1).



68655

11. Extend the SIR deployment harness and adapter to the full length from the deployment fixture or area.



68656

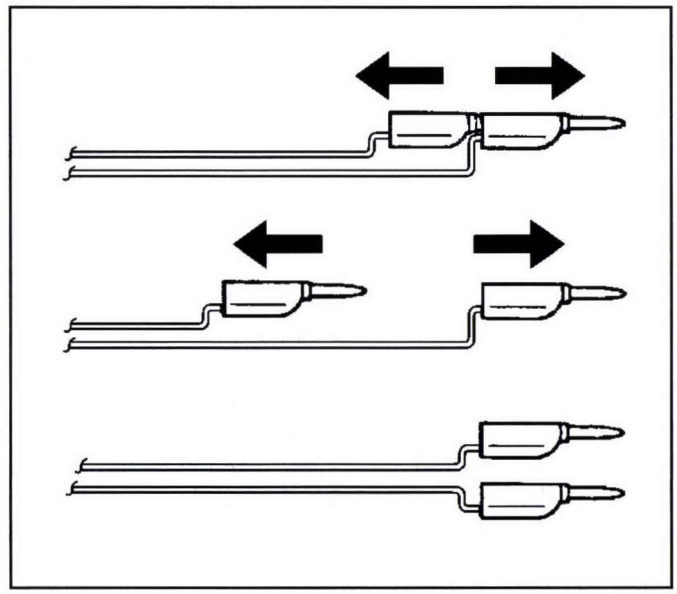
Note: On a dual stage air bag, both connectors must be attached to the deployment harness adapter. This will ensure that both stage 1 and stage 2 of the deployment loops are energized, regardless of the deployment state.

12. Connect the air bag (1) to the adapter (2) on the SIR deployment harness (3).

Note:

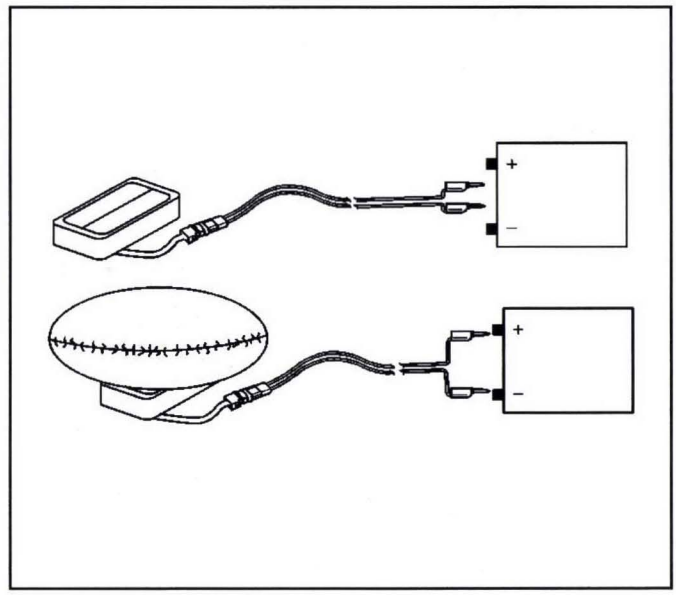
- The rapid expansion of gas involved with deploying an air bag is very loud. Notify all the people in the immediate area that you intend to deploy the air bag.
- When the air bag deploys, the deployment fixture may jump about 30 cm (1 ft) vertically. This is a normal reaction of the air bag due to the force of the rapid expansion of gas inside the air bag.
- If you are deploying a dual stage air bag with stage 1 already deployed, the fixture may not move and the noise may have been reduced.

13. Clear the area of people.



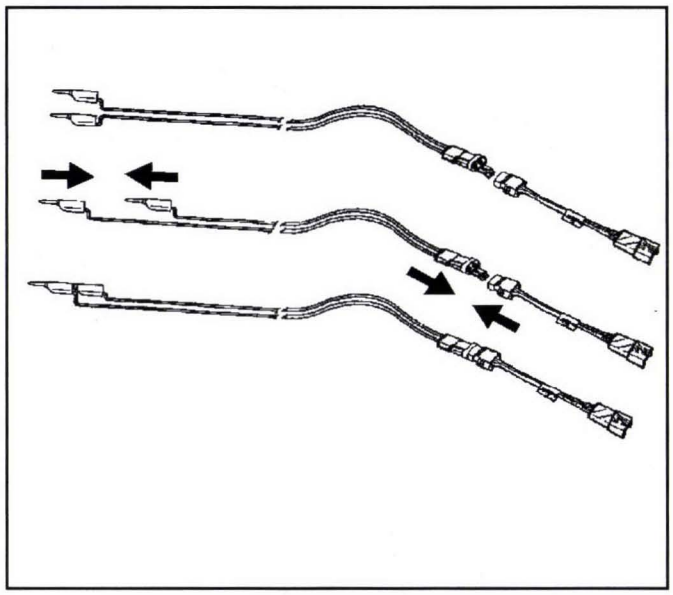
39382

14. Separate the 2 banana plugs on the SIR deployment harness that were shorted together earlier in the procedure.



39388

15. Place a 12 V minimum/2A minimum power source, such as a vehicle battery, near the shorted end of the harness.
16. Connect the SIR deployment harness wires to the power source. Deployment of the air bag will occur when contact is made.



9581

17. Disconnect the SIR deployment harness from the power source after the air bag deploys.
18. If the air bag did not deploy, disconnect the adapter and discontinue the procedure and contact the Technical Assistance Group.

    If deployment was successful, proceed to the following steps.

Warning: Refer to SIR Deployed Inflator Modules Are Hot Warning on page 0-6.

19. Seat one banana plug into the other in order to short the deployment harness leads.
20. Put on a pair of shop gloves.
21. Disconnect the pigtail adapter from the air bag as soon as possible.
22. Inspect the pigtail adapter and the SIR deployment harness. Replace as needed.
23. Dispose of the deployed air bag through normal refuse channels.
24. Wash your hands with a mild soap.

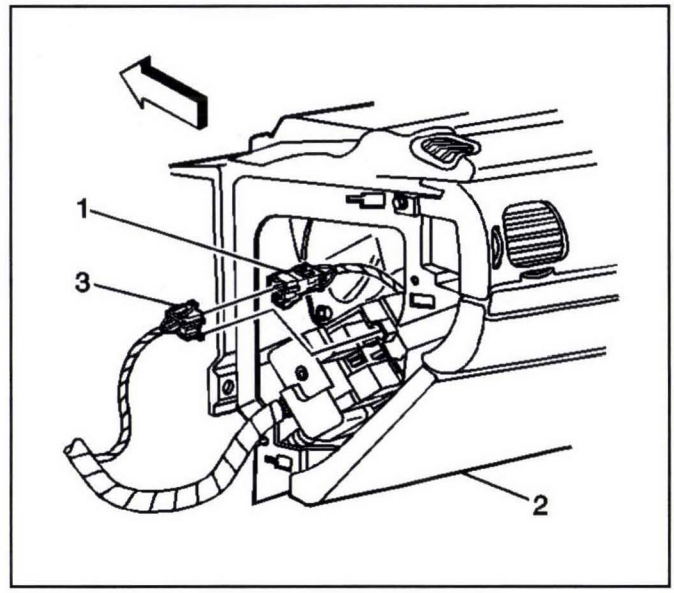
Deployment Inside Vehicle – Vehicle Scrapping Procedure

Deploy the air bags inside of the vehicle when destroying the vehicle or when salvaging the vehicle for parts. This includes, but is not limited to, the following situations:

- The vehicle has completed all useful life.
- Irrepairable damage occurred to the vehicle in a non-deployment type accident.
- Irrepairable damage occurred to the vehicle during a theft.
- The vehicle is being salvaged for parts to be used on a vehicle with a different VIN, as opposed to rebuilding as the same VIN.

Warning: Refer to SIR Inflatable Module Deployment Outside Vehicle Warning on page 0-6.

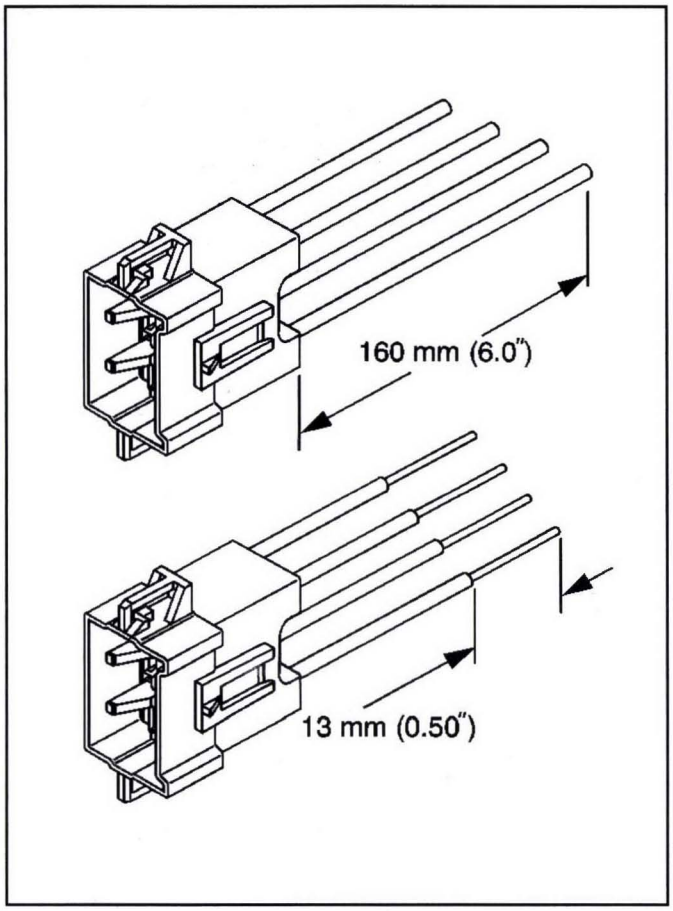
1. Lower the driver and passenger windows.
2. Vehicle OFF, and remove the key(s) from vehicle.
3. Check that all air bags which will be deployed are mounted securely.
4. Remove all loose objects from the front seats.



812533

Warning: A deployed dual stage inflator module will look the same whether one or both stages were used. Always assume a deployed dual stage inflator module has an active stage 2. Improper handling or servicing can activate the inflator module and cause personal injury.

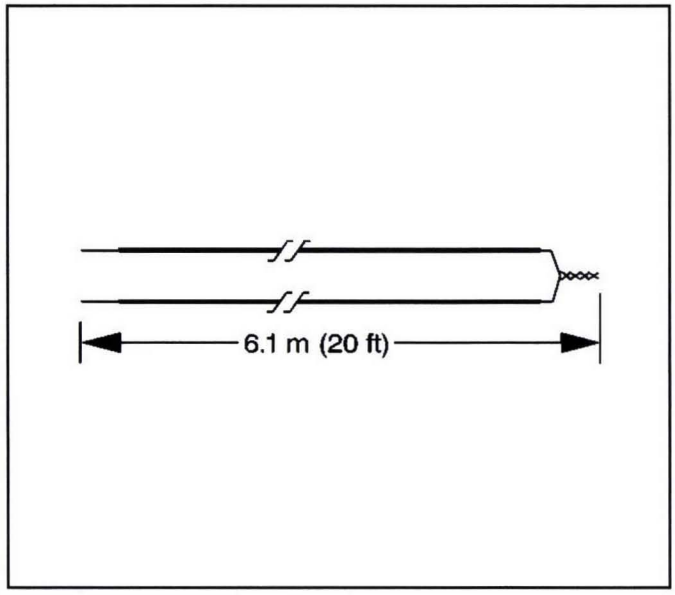
5. Disconnect the steering wheel air bag yellow connector (1) from vehicle harness yellow connector (3).



566915

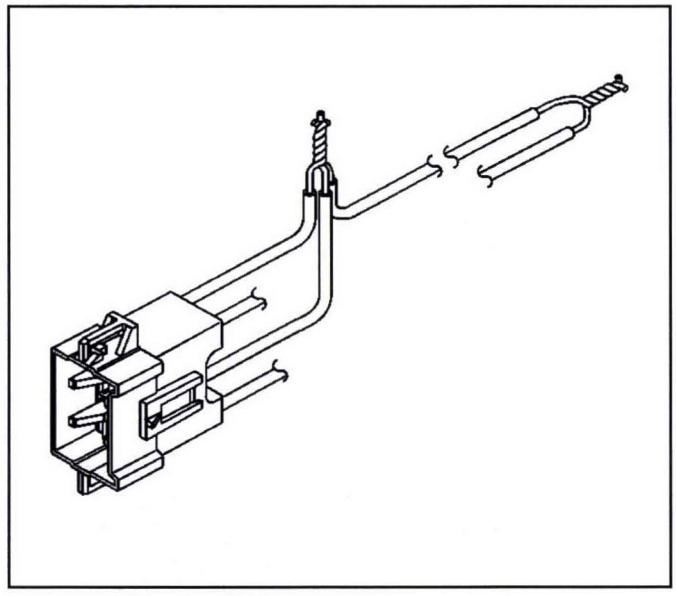
Note: If the vehicle is equipped with dual stage air bags the steering wheel air bag and instrument panel air bag will each have 4 wires. Refer to *Component Connector End Views on page 11-455* for determining high and low circuits.

6. Cut the yellow harness connector out of the vehicle, leaving at least 16 cm (6 in) of wire at the connector.
7. Strip 13 mm (0.5 in) of insulation from each of the connector wire leads.



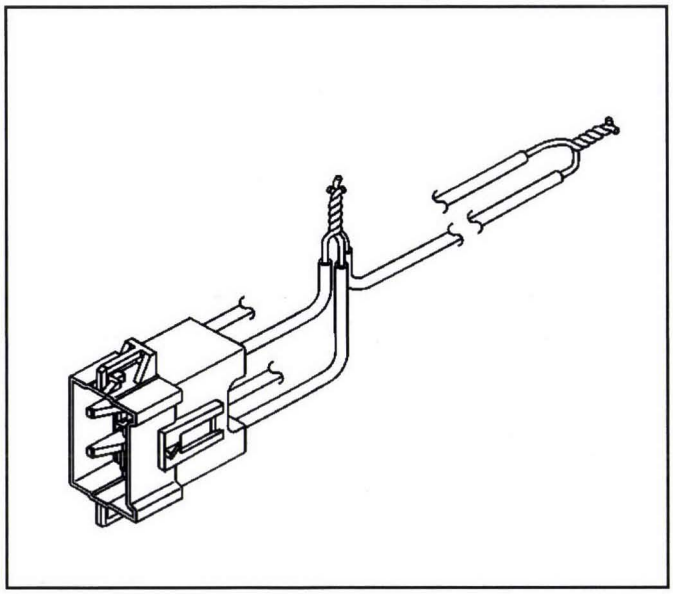
68651

8. Cut two 6.1 m (20 ft) deployment wires from a 0.8 mm (18 gauge) or thicker multi-strand wire. Use these wires to fabricate the driver deployment harness.
9. Strip 13 mm (0.5 in) of insulation from both ends of the wires.
10. Twist together one end from each of the wires in order to short the wires. Deployment wires shall remain shorted, and not connected to a power source until you are ready to deploy the air bag.

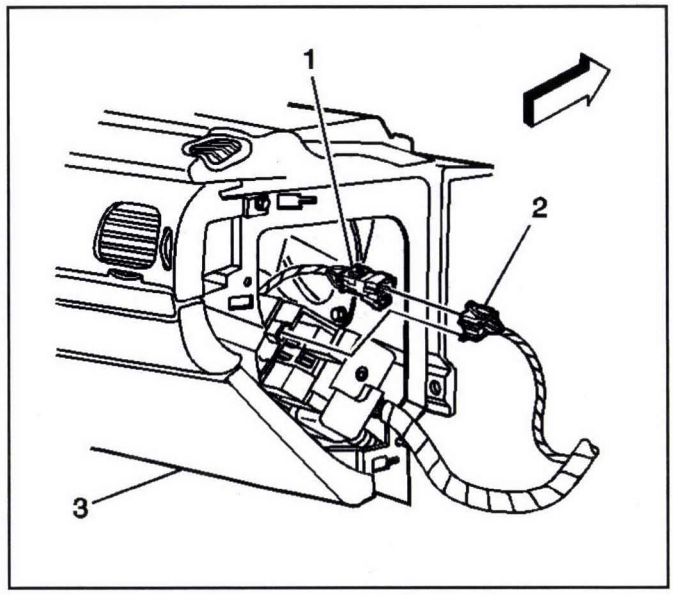


566918

11. Twist together the 2 connector wire leads from the high circuits from both stages of the steering wheel air bag, to one set of deployment wires. Refer to *Component Connector End Views on page 11-455* in order to determine the correct circuits.
12. Inspect that the 3-wire connection is secure.
13. Secure and insulate the 3-wire connection to the deployment harness using electrical tape.



566932



816857

14. Twist together the 2 connector wire leads from the low circuits from both stages of the steering wheel air bag, to one set of deployment wires. Refer to *Component Connector End Views on page 11-455* in order to determine the correct circuits.
15. Inspect that the 3-wire connection is secure.
16. Secure and insulate the 3-wire connection to the deployment harness using electrical tape.
17. Connect the deployment harness to the connector on the steering wheel air bag.
18. Route the deployment harness out of the driver side of the vehicle.
19. Disconnect the yellow left roof rail harness connector from the vehicle harness connector.
20. Cut the harness connector out of the vehicle, leaving at least 16 cm (6 in) of wire at the connector.
21. Strip 13 mm (0.5 in) of insulation from each of the connector wire leads.
22. Cut two 6.1 m (20 ft) deployment wires from a 0.8 mm (18 gauge) or thicker multi-strand wire. These wires will be used to fabricate the roof rail air bag deployment harness.
23. Strip 13 mm (0.5 in) of insulation from both ends of the wires.
24. Twist together one end from each of the wires in order to short the wires.
25. Twist together one connector wire lead to one deployment wire.
26. Secure and insulate the connection using electrical tape.
27. Twist together and tape the remaining connector wire lead to the remaining deployment wire.
28. Connect the deployment harness to the yellow connector of the roof rail air bag.
29. Route the deployment harness out of the driver side of the vehicle.
30. Disconnect the instrument panel air bag yellow harness connector (1) from the vehicle harness connector (2).

    Note: If the vehicle is equipped with dual stage air bags the steering wheel air bag and instrument panel air bag will each have 4 wires. Refer to *Component Connector End Views on page 11-455* for determining high and low circuits.
31. Cut the yellow harness connector out of the vehicle, leaving at least 16 cm (6 in) of wire at the connector.
32. Strip 13 mm (0.5 in) of insulation from each of the connector wire leads.
33. Cut two 6.1 m (20 ft) deployment wires from a 0.8 mm (18 gauge) or thicker multi-strand wire. These wires will be used to fabricate the passenger deployment harness.
34. Strip 13 mm (0.5 in) of insulation from both ends of the wires.
35. Twist together one end from each of the wires in order to short the wires.
36. Twist together the 2 connector wire leads from the high circuits from both stages of the instrument panel air bag to one set of deployment wires. Refer to *Component Connector End Views on page 11-455* in order to determine the correct circuits.
37. Inspect that the 3-wire connection is secure.
38. Secure and insulate the 3-wire connection to the deployment harness using electrical tape.
39. Twist together the 2 connector wire leads from the low circuits from both stages of the instrument panel air bag to one set of deployment wires. Refer to *Component Connector End Views on page 11-455* in order to determine the correct circuits.
40. Inspect that the 3-wire connection is secure.
41. Secure and insulate the 3-wire connection to the deployment harness using electrical tape.

42. Connect the deployment harness to the instrument panel air bag in-line connector.
43. Route the deployment harness out of the passenger side of the vehicle.
44. Disconnect the yellow harness connector to the right roof rail air bag from the vehicle harness connector.
45. Cut the harness connector out of the vehicle, leaving at least 16 cm (6 in) of wire at the connector.
46. Strip 13 mm (0.5 in) of insulation from each of the connector wire leads.
47. Cut two 6.1 m (20 ft) deployment wires from a 0.8 mm (18 gauge) or thicker multi-strand wire. These wires will be used to fabricate the roof rail air bag deployment harness.
48. Strip 13 mm (0.5 in) of insulation from both ends of the wires.
49. Twist together one end from each of the wires in order to short the wires.
50. Twist together one connector wire lead to one deployment wire.
51. Secure and insulate the connection using electrical tape.
52. Twist together and tape the remaining connector wire lead to the remaining deployment wire.
53. Connect the deployment harness to the roof rail air bag yellow connector.
54. Route the deployment harness out of the passenger side of the vehicle.
55. Completely cover the windshield and the front door window openings with a drop cloth.
56. Stretch to the full length all of the deployment harness wires on the right side of the vehicle.
57. Deploy each deployment loop one at a time.
58. Place a power source, 12 V minimum/2A minimum, such as a vehicle battery, near the shorted end of the harnesses.
59. Separate one set of wires and touch the wire ends to the power source in order to deploy the selected air bag.
60. Disconnect the deployment harness from the power source and twist the wire ends together.
61. Continue the same process with the remaining deployment harnesses.
62. Disconnect all harnesses from the vehicle.
63. Discard the harnesses.
64. Scrap the vehicle in the same manner as a non-SIR equipped vehicle.
65. If one or all of the air bags did not deploy, remove the undeployed air bags from the vehicle.

Pretensioner Handling and Scrapping

Scrapping Procedure

During the course of a vehicles useful life, certain situations may arise which will necessitate the disposal of a live (undeployed) pretensioner. The following information covers the proper procedures for the disposing of a live (undeployed) pretensioner. Deploy the pretensioner before disposal. Do not dispose of a live (undeployed) pretensioner through normal disposal channels until the pretensioner has been deployed. The following information covers the proper procedures for the disposing of a live (undeployed) pretensioner.

- After replacement of a pretensioner under warranty. The pretensioner may need to be returned undeployed to the original manufacturer of pretensioner.
- If the vehicle is the subject of a Product Liability report related to the SIR system and is subject to a Preliminary Investigation (GM-1241). Do not alter the SIR system in any manner.
- If the vehicle is involved in a campaign affecting the pretensioners. Follow the instructions in the Campaign Service Bulletin for proper SIR handling procedures.

Deployment Procedures

Note: Some countries, states or localities may not allow service deployment of air bags without special permission or training. Local laws regarding deploying and scrapping of air bags/devices with pyrotechnics must be followed.

The pretensioner can be deployed inside or outside of the vehicle. The method used depends upon the final disposition of the vehicle. Review the following procedures in order to determine which will work best in a given situation.

Deployment Inside the Vehicle

Refer to *Inflatable Restraint Module Handling and Scrapping on page 12-173* for deploying the pretensioner inside vehicle under Vehicle Scrapping Procedure.

Deployment Outside Vehicle for Seat Belt Pretensioners

Deploy the seat belt pretensioners outside of the vehicle when the vehicle will be returned to service. Situations that require deployment outside of the vehicle include the following:

- Using the SIR diagnostics, you determine that the seat belt pretensioner is malfunctioning.
- The pretensioner pigtail (if equipped) is damaged.
- The pretensioner connector is damaged.
- The pretensioner connector terminal is damaged.

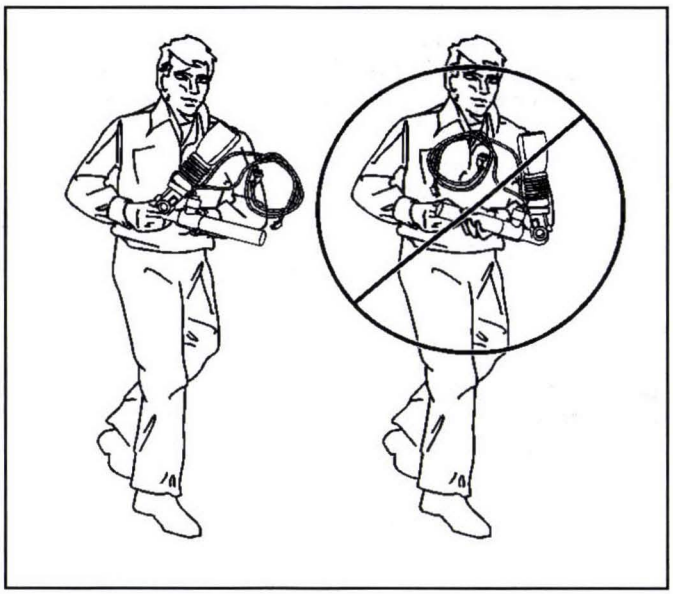
Deployment and disposal of a malfunctioning seat belt pretensioner is subject to any required retention period.

Warning: In order to prevent accidental deployment of the pretensioner which could cause personal injury, do not dispose of an undeployed pretensioner as normal shop waste. The undeployed pretensioner contains substances that could cause severe illness or personal injury if the sealed container is damaged during disposal. Use the following deployment procedures to safely dispose of an undeployed pretensioner. Failure to dispose of a pretensioner as instructed may be a violation of federal, state, or local laws.

Warning: When you are deploying a pretensioner for disposal, perform the deployment procedures in the order listed. Failure to follow the procedures in the order listed may result in personal injury.

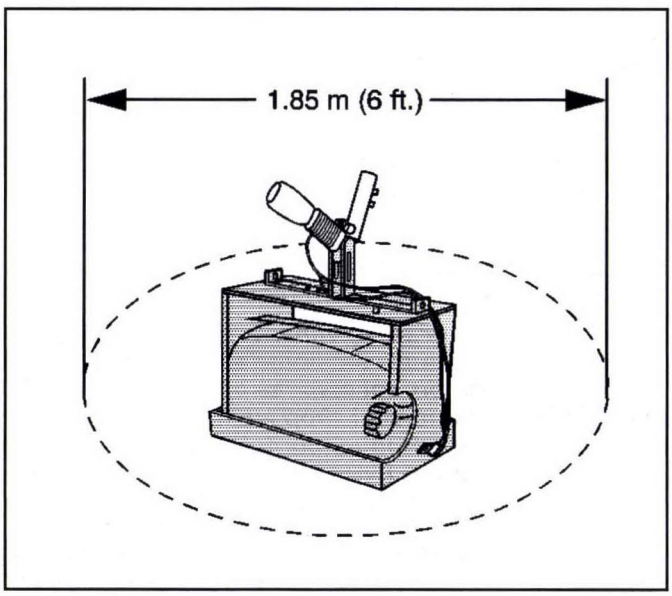
Special Tools

- *EL-39401-B* SIR Deployment Fixture
- *EL-38826* SIR Deployment Harness



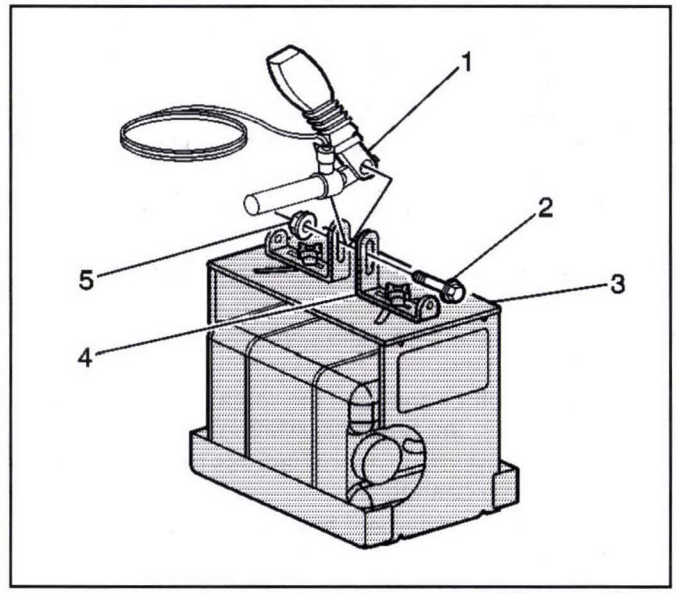
483842

1. Turn the ignition switch to the OFF position.
2. Remove the ignition key.
3. Put on safety glasses.
4. Remove the seat belt pretensioner from the vehicle.
5. When carrying a pretensioner to the deployment area keep the open end of pretensioner pointed away from the body.



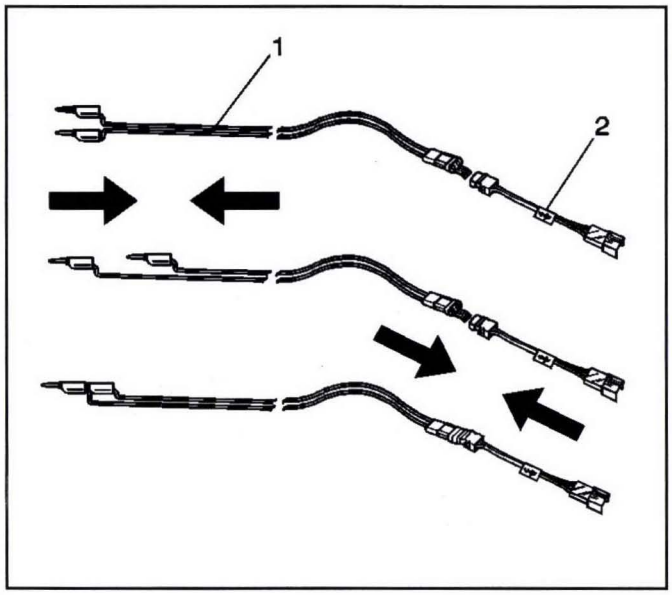
483844

6. Clear a space on the ground about 1.85 M (6 ft) in diameter for deployment of the pretensioner. If possible, use a paved, outdoor location free of activity. Otherwise, use a space free of activity on the shop floor. Make sure you have sufficient ventilation.
7. Make sure no loose or flammable objects are in the area.
8. Place the *EL-39401-B* SIR deployment fixture in the center of the cleared area.
9. Fill the fixture plastic reservoir with water or sand.



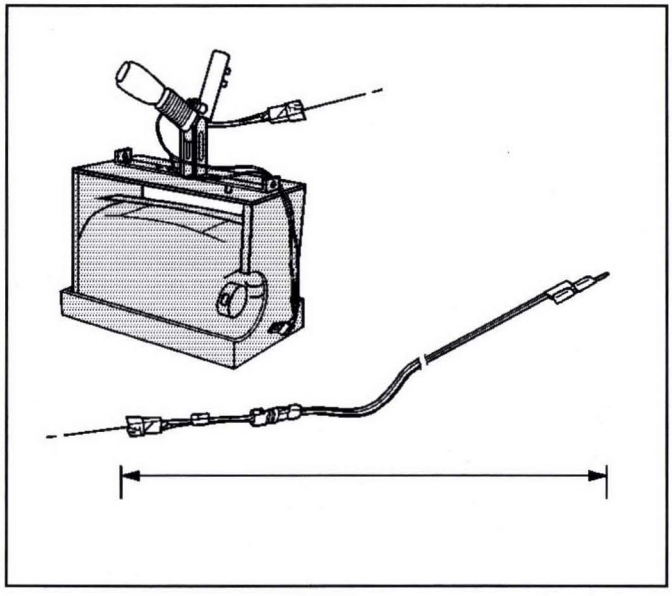
483846

10. Mount the pretensioner (1) in the SIR deployment fixture (3) with the open end facing up using the following mounting method.
    10.1. Adjust and secure the EL-39401-B arms (4) to the deployment fixture (3).
    10.2. To mount, use the proper size bolt (2) and nut (5) with washers in order to secure the pretensioner (1) to the deployment fixture brackets (4).
    10.3. Securely tighten all fasteners prior to deployment.



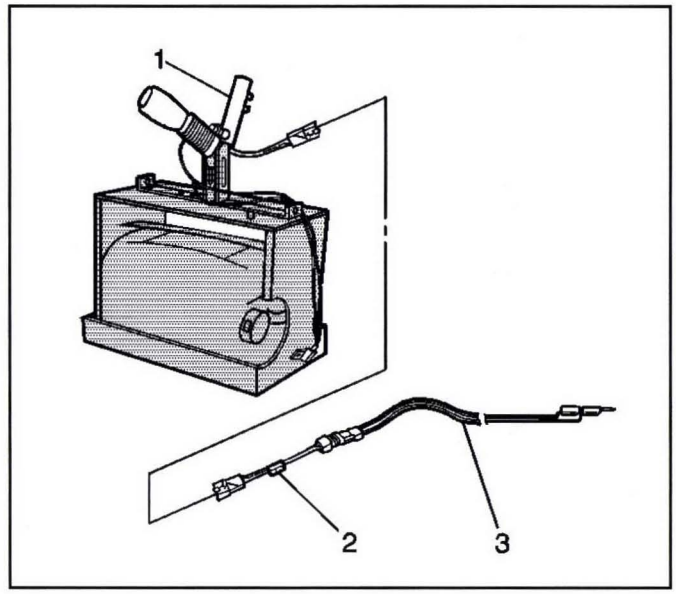
68645

11. Inspect the *EL-38826* SIR deployment harness and the appropriate pigtail adapter for damage. Replace as needed.
12. Short the 2 SIR deployment harness (1) leads together using one banana plug seated into the other.
13. Connect the appropriate pigtail adapter (2) to the SIR deployment harness (1).



483848

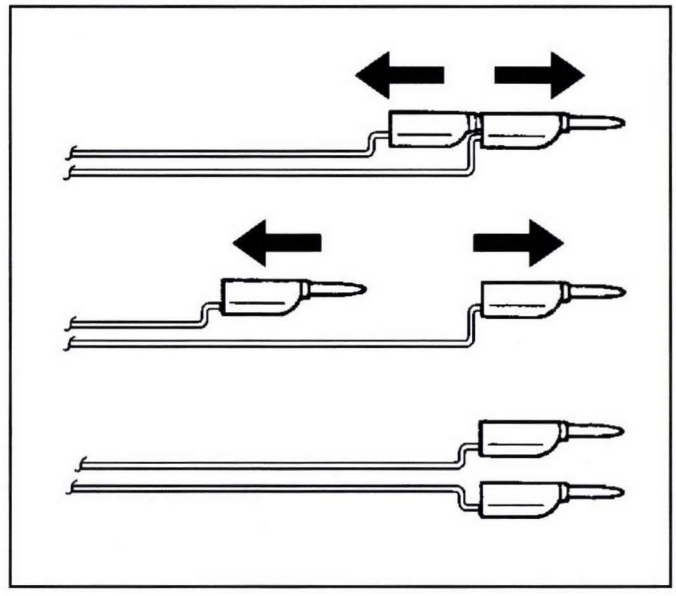
14. Extend the SIR deployment harness and adapter to full length from the deployment fixture.



483850

15. Connect the pretensioner (1) to the adapter (2) on the deployment harness (3).

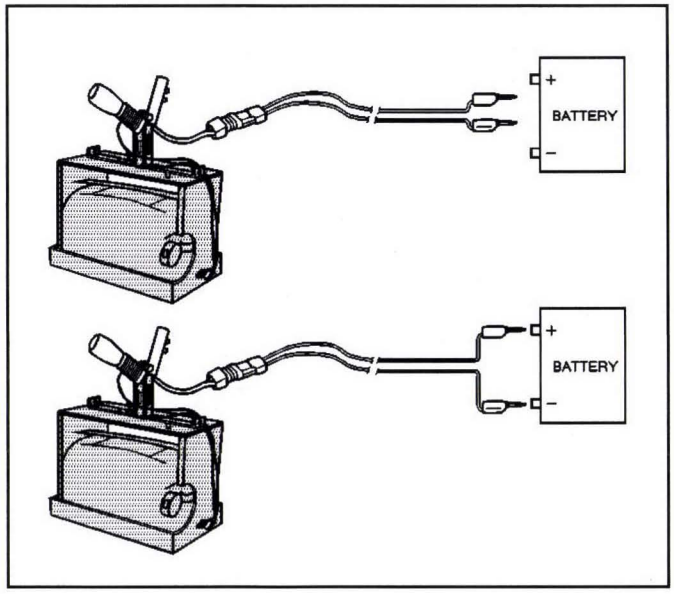
    Note: The rapid gas expansion involved with deploying a pretensioner is very loud. Notify all the people in the immediate area that you intend to deploy the seat belt pretensioner.
16. Clear the area of people.



39382

Warning: When you are deploying a pretensioner for disposal, perform the deployment procedures in the order listed. Failure to follow the procedures in the order listed may result in personal injury.

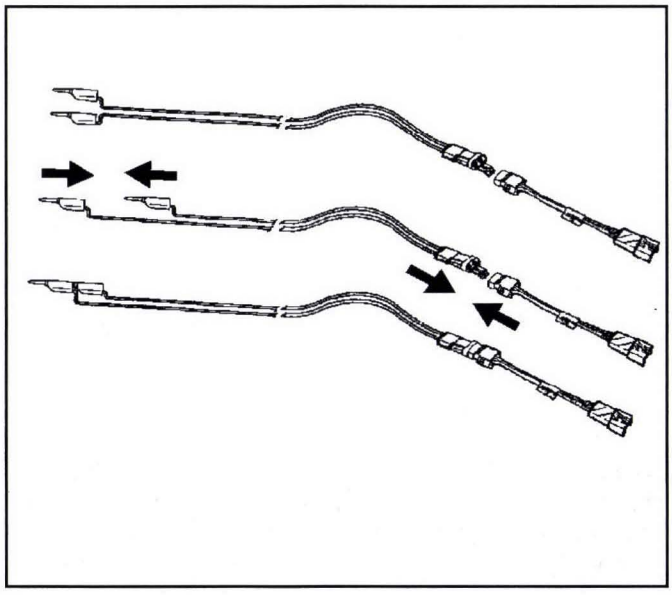
17. Separate the 2 banana plugs on the SIR deployment harness.



483854

Note: When the seat belt pretensioner deploys, the deployment fixture may jump about 30 cm (1 ft) vertically. This is a normal reaction of the seat belt pretensioner due to the force of the rapid expansion of gas inside the pretensioner.

18. Place a 12 V minimum/2 A minimum power source (i.e., vehicle battery) near the shorted end of the harness.
19. Connect the SIR deployment harness wires to the power source. Pretensioner deployment will occur when contact is made.
20. Disconnect the SIR deployment harness from the power source after the pretensioner deploys.



9581

21. Seat one banana plug into the other in order to short the deployment harness leads.
22. If the pretensioner did not deploy, disconnect the adapter and discontinue the procedure. Contact the Technical Assistance Group. Otherwise, proceed to the following steps.
23. Put on a pair of shop gloves.
24. Disconnect the pigtail adapter from the pretensioner as soon as possible.
25. Inspect the pigtail adapter and the SIR deployment harness. Replace as needed.
26. Dispose of the deployed pretensioner through normal refuse channels.
27. Wash hands with a mild soap.

Description and Operation

Supplemental Inflatable Restraint System Description and Operation

SIR System Overview

The supplemental inflatable restraint (SIR) system supplements the protection offered by the seat belts. The SIR system contains an Inflatable Restraint Sensing and Diagnostic Module, air bags, seat belt pretensioners (anchor and retractor), and impact sensors. The Inflatable Restraint Sensing and Diagnostic Module determines the severity of a collision with the assistance of impact sensors located at strategic points on the vehicle. When the Inflatable Restraint Sensing and Diagnostic Module detects a collision, the Inflatable Restraint Sensing and Diagnostic Module will process the information provided by the sensors to further support air bag or pretensioner deployment. The Inflatable Restraint Sensing and Diagnostic Module will deploy the air bags and pretensioners if it detects a collision of sufficient force. If the force of the impact is not sufficient to warrant air bag deployment, the Inflatable Restraint Sensing and Diagnostic Module may still deploy the seat belt pretensioners. The Inflatable Restraint Sensing and Diagnostic Module contains a sensing device that converts vehicle velocity changes to an electrical signal. The Inflatable Restraint Sensing and Diagnostic Module compares these signals to values stored in memory. If the signals exceed a stored value, the Inflatable Restraint Sensing and Diagnostic Module will determine the severity of the impact and either cause current to flow through the frontal deployment loops deploying the frontal air bags and pretensioners, or it will deploy the pretensioners only. The Inflatable Restraint Sensing and Diagnostic Module continuously monitors the deployment loops for malfunctions and illuminates the SIR system AIR BAG indicator if a fault is detected. The Inflatable Restraint Sensing and Diagnostic Module performs continuous diagnostic monitoring of the SIR system electrical components. Upon detection of a circuit malfunction, the Inflatable Restraint Sensing and Diagnostic Module will set a DTC and inform the driver by illuminating the SIR system AIR BAG indicator. The steering column and knee bolsters are designed to absorb energy and compress during frontal collisions in order to limit leg movement and decrease the chance of injury to the driver and passenger.

SIR System AIR BAG Indicator

The SIR system AIR BAG indicator, located in the instrument cluster, is used to notify the driver of SIR system malfunctions and to verify that the inflatable

restraint sensing and diagnostic module is communicating with the instrument cluster. When the ignition is turned ON, the Inflatable Restraint Sensing and Diagnostic Module is supplied with ignition positive voltage. The instrument cluster will momentarily turn on the SIR system AIR BAG indicator. While the indicator is on, the Inflatable Restraint Sensing and Diagnostic Module conducts tests on all SIR system components and circuits. If no malfunctions are detected the Inflatable Restraint Sensing and Diagnostic Module will communicate with the instrument cluster through the serial data circuit and command the SIR system AIR BAG indicator OFF. The Inflatable Restraint Sensing and Diagnostic Module provides continuous monitoring of the air bag circuits by conducting a sequence of checks. If a malfunction is detected the Inflatable Restraint Sensing and Diagnostic Module will store a diagnostic trouble code (DTC) and command the instrument cluster to illuminate the SIR system AIR BAG indicator via serial data. The presence of a SIR system malfunction could result in non-deployment of the air bags or deployment in conditions less severe than intended. The SIR system AIR BAG indicator will remain ON until the malfunction has been repaired.

Inflatable Restraint Sensing and Diagnostic Module

The inflatable restraint sensing and diagnostic module is a microprocessor and the control center for the supplemental inflatable restraint (SIR) system. The Inflatable Restraint Sensing and Diagnostic Module contains internal sensors along with external impact sensors, mounted at strategic locations on the vehicle. In the event of a collision, the Inflatable Restraint Sensing and Diagnostic Module compares the signals from the internal and external impact sensors to a value stored in memory. When the generated signals exceed the stored value, the Inflatable Restraint Sensing and Diagnostic Module will cause current to flow through the appropriate deployment loops to deploy the air bags. The Inflatable Restraint Sensing and Diagnostic Module records the SIR system status when a deployment occurs and illuminates the SIR system AIR BAG indicator located in the instrument cluster. The Inflatable Restraint Sensing and Diagnostic Module performs continuous diagnostic monitoring of the SIR system electrical components and circuitry when the ignition is turned ON. If the Inflatable Restraint Sensing and Diagnostic Module detects a malfunction, a DTC will be stored and the Inflatable Restraint Sensing and Diagnostic Module will request the instrument cluster to illuminate the SIR system AIR BAG indicator, notifying the driver that a malfunction exists. In the event that ignition positive voltage is lost during a collision, the Inflatable Restraint Sensing and Diagnostic Module maintains a 23-volt loop reserve for deployment of the air bags. It is important when disabling the SIR system for servicing or rescue operations to allow the 23-volt loop reserve to dissipate, which could take up to 1 minute.

Air Bags

This vehicle contains 10 air bags. The 10 air bags are located in the steering wheel (dual inflators), instrument panel (passenger side) (dual inflators), driver side (B-pillar), passenger side (B-pillar), driver side (C-pillar), passenger side (C-pillar), driver side knee, passenger side knee, left roof rail, and right roof rail. To view the locations of the air bags refer to *Master Electrical Component List on page 11-343*. Air bags contain a housing, inflatable air bag, two initiating devices (if dual air bags), canister of gas generating material and, in some cases, stored compressed gas. The deployment loops supply current to deploy the air bags. The driver steering wheel and passenger instrument panel air bags have two stages of deployment, which varies the amount of restraint to the occupant according to the collision severity. For moderate frontal collisions the air bags deploy at less than full deployment which consists of stage 1 of the air bag. For more severe frontal collisions a full deployment is initiated which consists of stage 1 and stage 2 of the air bag. The current passing through the air bags ignite the material in the canister producing a rapid generation of gas and is some cases, the release of compressed gas. The gas produced from this reaction rapidly inflates the air bag. Once the air bag is inflated it quickly deflates through the air bag vent holes and/or the bag fabric. A shorting bar (if equipped) is located in the connector.

Seat Belt Pretensioners (Anchor and Retractor)

The seat belt pretensioners (driver and passenger) consist of a housing, seat belt retractor (located in the B-pillar), seat belt anchor (located on the floor), seat belt webbing, an initiator, and a canister of gas generating materials. To view the locations of the seat belt pretentioners refer to *Master Electrical Component List on page 11-343*. The initiator is part of the seat belt pretensioner deployment loop. When the vehicle is involved in a collision of sufficient force, the Inflatable Restraint Sensing and Diagnostic Module causes current to flow through the seat belt deployment loops to the initiator. Current passing through the initiator ignites the material in the canister producing a rapid generation of gas. The gas produced from this reaction deploys the seat belt pretensioners which removes all of the slack in the seat belts. Depending on the severity of the collision, the seat belt pretensioners may deploy without the frontal air bags deploying, or they will deploy immediately before the frontal air bags deploy. A shorting bar (if equipped) is located in the connector.

Impact Sensors

This vehicle contains 6 impact sensors. There are 6 impact sensors which are located in the front of the vehicle (2, left and right), in the front doors (2, left and right), and on the B-pillar (2, left and right). To view the locations of the impact sensors refer to *Master Electrical Component List on page 11-343*. The impact sensors contain a sensing device which monitors vehicle acceleration and velocity changes to detect side collisions that are severe enough to warrant air bag deployment. The impact sensors are not part of the deployment loop, but instead provide input to the Inflatable Restraint Sensing and Diagnostic Module. The Inflatable Restraint Sensing and Diagnostic Module contains a microprocessor that performs calculations using the measured accelerations and compares these calculations to a value stored in memory. When the generated calculations exceed the

stored value, the Inflatable Restraint Sensing and Diagnostic Module will cause current to flow through the deployment loops deploying the appropriate air bags.

Passenger Presence Detection System and Passenger Air Bag Indicator

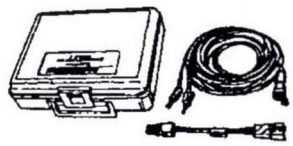
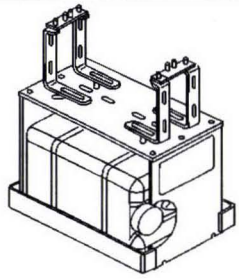
Note: The passenger presence system (PPS) is a calibrated unit. When replacing the assembly all parts in the service kit must remain together. Do not mix any of the old parts with the new parts. After repairing or replacing the PPS, the Preload test must be performed in order to function properly.

The passenger presence system (PPS) is used to monitor the type of occupant that is sitting in the front passenger seat and communicate the status to the inflatable restraint sensing and diagnostic module. The Inflatable Restraint Sensing and Diagnostic Module then uses this information to determine whether to enable or suppress the deployment of the passenger instrument panel air bag. PPS consists of an electronic control module, a sensor mat in the seat, a harness, and PASSENGER AIR BAG ON/OFF indicators. PPS transmits and receives a low-level electric field. The measured capacitance value of this field is used to determine the type of occupant sitting in the front passenger seat. If the measured capacitance is less than a calibrated value, then the passenger presence module will send a serial data signal to the Inflatable Restraint Sensing and Diagnostic Module to disable the passenger instrument panel air bag. If the measured capacitance is greater than a calibrated value, then the passenger presence module will send a serial data signal to the Inflatable Restraint Sensing and Diagnostic Module to enable the passenger instrument panel air bag. The Inflatable Restraint Sensing and Diagnostic Module will notify the customer of the enable/disable status by illuminating one of the PASSENGER AIR BAG ON/OFF indicator. The PPS monitors itself for faults and will displays diagnostic trouble codes (DTCs) on the scan tool. When a fault is detected, the passenger presence module sends out a message to the Inflatable Restraint Sensing and Diagnostic Module. The Inflatable Restraint Sensing and Diagnostic Module responds by sending a command message to the IPC to illuminate the SIR system AIR BAG indicator.

Seat Belt Indicators

The seat belt indicators are controlled through the inflatable restraint sensing and diagnostic module. For further information on seat belt indicators refer to *Seat Belt System Description and Operation on page 12-98*.

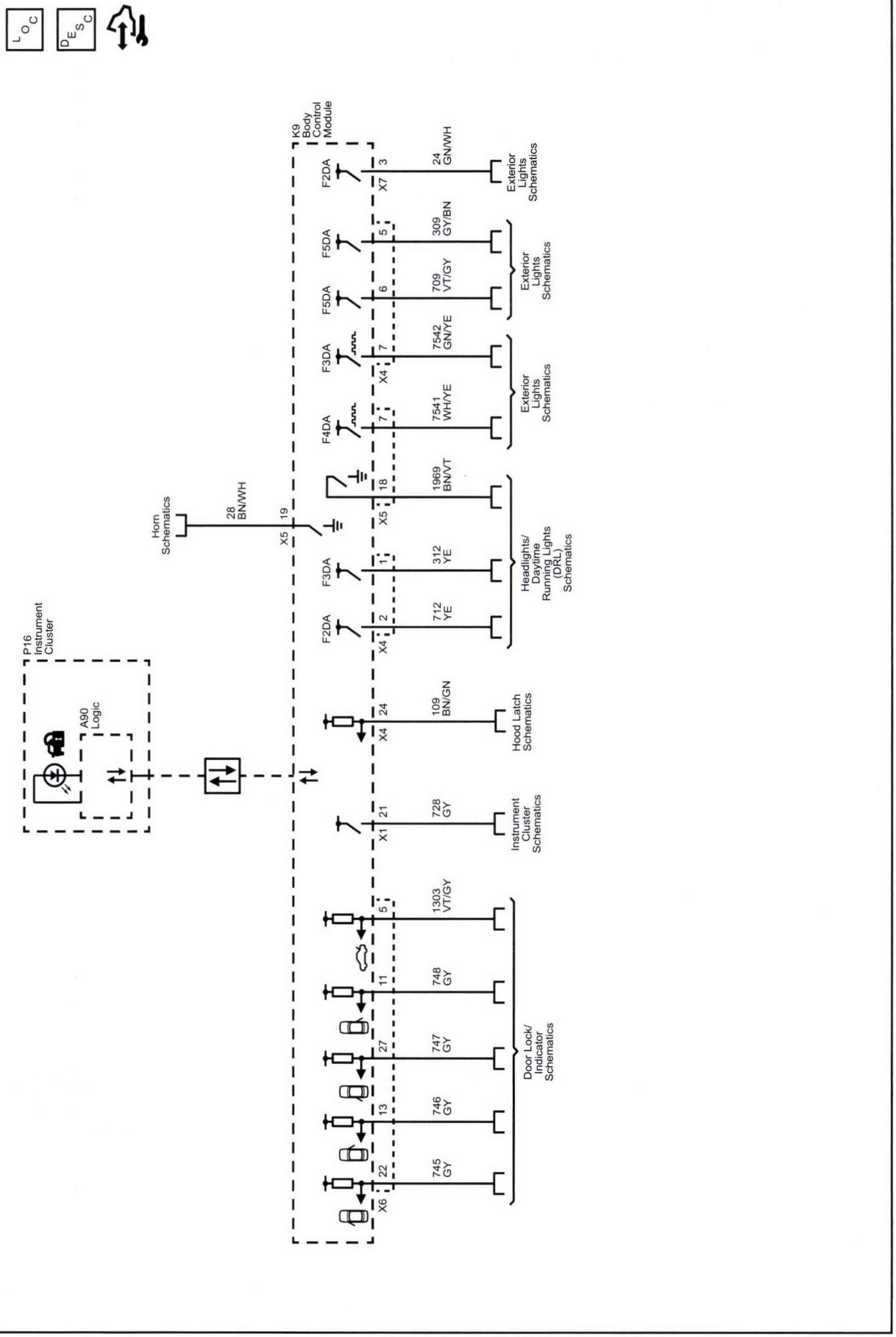
Special Tools and Equipment

Illustration	Tool Number/ Description
 9082	EL 38826 J 38826 KM 799-3 SIR Deployment Harness
 456738	EL 39401-B J 39401-B SIR Deployment Fixture

Theft Deterrent

Schematic and Routing Diagrams

Theft Deterrent System Schematics (Theft Deterrent)



Diagnostic Information and Procedures

Symptoms - Theft Deterrent

Note: The following steps must be completed before using the symptom tables.

1. Perform *Diagnostic System Check - Vehicle on page 6-91* in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to the following *Theft Systems Description and Operation on page 12-189*.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the Theft Deterrent System. Refer to *Checking Aftermarket Accessories on page 11-871*.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- *Content Theft Deterrent Malfunction on page 12-187*
- *Security Indicator Malfunction on page 12-188*

Content Theft Deterrent Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Circuit/System Description

The content theft deterrent system is a software based system in which the Body Control Module (BCM) actively monitors certain inputs to determine if unauthorized vehicle access is being attempted. Based on inputs such as the door ajar switches, the rear compartment ajar switch, and the hood ajar switch, the BCM determines whether a content theft deterrent alarm is warranted. If unauthorized access is being detected, the BCM will pulse the vehicle horn and flash the exterior lamps as a means of theft deterrence.

Diagnostic Aids

The scan tool BCM Content Theft Deterrent Trigger History 1, 2, and 3 parameters can be used to help isolate an intermittent unwanted content theft deterrent alarm. These parameters are a rolling history of the previous three causes of a theft deterrent alarm. If all three parameters are indicating the same alarm trigger, the indicated input should be the starting point when diagnosing an intermittent concern.

Reference Information

Schematic Reference

Theft Deterrent System Schematics on page 12-186

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Theft Systems Description and Operation on page 12-189

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify each indicator/message transition between the ajar and closed state while opening and closing each vehicle door, hood, and rear compartment.

⇒ **If the indicator/message does not change**

Refer to *Door Ajar Indicator Malfunction on page 4-240* or *Hood Ajar Indicator/Message Malfunction on page 3-9*.

⇓ **If each indicator/message changes**

3. Completely lower the driver door window and close all vehicle doors, ignition OFF.
4. Arm the content theft deterrent system by locking the door with the keyless entry transmitter.
5. Verify the scan tool BCM Content Theft Deterrent Alarm Status parameter is Armed.

⇒ **If not Armed**

Refer to *Keyless Entry System Malfunction on page 12-69*.

⇓ **If Armed**

6. Without disarming the system, reach in through the open driver window and open the driver door.

7. Verify the scan tool BCM Content Theft Deterrent Alarm Status parameter is Alarm.

⇒ **If not Alarm**

Replace the K9 Body Control Module.

⇓ **If Alarm**

8. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for Body Control Module replacement, programming, and setup

---

Security Indicator Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control	2	2	1	—
1. Security Indicator Always On 2. Security Indicator Inoperative				

Circuit/System Description

The security indicator is controlled by the Body Control Module (BCM) based on commands from the content theft deterrent system. The security indicator is located in the driver information center. When the content theft deterrent system requests the indicator be illuminated, the BCM applies voltage to the control circuit, illuminating the indicator.

Reference Information

Schematic Reference

Instrument Cluster Schematics on page 8-77

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Theft Systems Description and Operation on page 12-189

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Arm the content theft deterrent system.
2. Verify the security indicator illuminates and/or flash during the arming sequence.

⇒ **If the indicator does not illuminate and/or flash**

Refer to Circuit/System Testing

⇓ **If the indicator illuminates and/or flashes**

3. All OK

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the A5 Driver Information Center.
2. Connect a test lamp between the control circuit terminal 2 and ground, ignition ON.
3. Verify the test lamp turns ON and OFF when commanding the Security Indicator Active and Inactive with a scan tool.

⇒ **If the test lamp is always OFF**

3.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.

3.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

3.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

3.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module, ignition ON.

3.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

4. Test or replace the A5 Driver Information Center.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Information Center Telltale Assembly Replacement on page 8-94*
- *Control Module References on page 6-3* for Body Control Module replacement, programming, and setup

Description and Operation

Theft Systems Description and Operation

When armed, the content theft deterrent system is designed to deter vehicle content theft by pulsing the horns and exterior lamps for approximately 30 seconds when an unauthorized vehicle entry is detected. However, the content theft deterrent system does not affect engine starting.

An unauthorized entry can be any of the following with the content theft deterrent system armed:

- Unauthorized entry into the underhood area
- Unauthorized entry into the rear compartment
- When any door is opened without using the UNLOCK command from a keyless entry transmitter
- After a battery reconnect, if the battery was disconnected with the content theft deterrent system armed

The components of the content theft deterrent system are:

- Body Control Module (BCM)
- Remote control door lock receiver
- Door ajar switches
- Rear compartment ajar switch
- Hood ajar switch

Arming the Content Theft Deterrent System

Use the following procedure in order to arm the system:

1. Place the shift lever in P (park).
2. Turn OFF the ignition.
3. Open any door.

Note: The system is not armed if the doors are locked manually; the remote keyless entry transmitter must be used to arm the content theft deterrent system.

4. Lock the doors by pressing the LOCK button on the transmitter. The system is in standby mode and will not start the arming timer until all doors are closed.
5. The system will begin the arm sequence immediately after the last door is closed. If the keyless entry transmitter is used to arm the system after the vehicle doors are closed, the arm sequence will begin as soon as the LOCK command is received from the transmitter.
6. Pressing the LOCK button on the keyless entry transmitter a second time will bypass the delayed arming function and force the system to arm.

Locking the Vehicle Without Arming the Content Theft Deterrent System

Locking the vehicle may be accomplished without arming the content theft deterrent system. Use of the manual door locks will lock the vehicle, but will not arm the content theft deterrent system.

Disarming an Armed System/Silencing an Alarm

If system arming has been requested by the keyless entry transmitter, it must be disarmed.

Note: Disconnecting the battery or removing fuses does not disable the arm or alarm modes, since the BCM stores the content theft deterrent mode status in memory.

- To disarm the content theft deterrent system in standby mode, perform one of the following:
  - Press the UNLOCK button on the keyless entry transmitter.
  - Insert a valid key into the ignition and switch to the ON position.
- To disarm the content theft deterrent system in the armed mode (non-event) or when activated (during an alarm event):
  - Press the UNLOCK button on the keyless entry transmitter.
  - Insert a valid key into the ignition and switch to the ON position

Content Theft Deterrent Circuit Description

The following is a description of each component used in the content theft deterrent system:

Body Control Module

The content theft deterrent system is an internal function of the BCM which utilizes serial data and various switch inputs information to perform content theft deterrent functions. When the BCM detects an unauthorized entry, it activates the horns and exterior lamps. The BCM has 4 basic modes (disarmed,

standby, armed, and alarm) for operating the content theft deterrent system. The different modes are described below.

1. The BCM has the content theft deterrent system in a disarmed mode until the following conditions are detected:
   - Ignition key turned to the OFF position.
   - Doors locked by the LOCK button on the transmitter.
2. The BCM enters the standby mode when the above conditions are detected. If a door was already opened when the arm mode was requested, the standby mode does not start the timer until the last door is closed.
3. When the last door is closed, a 15 second timer is activated. Once the timer has expired, the BCM enters the armed mode. After this delay, any unauthorized entry will activate the alarm mode.
4. When the BCM detects an unauthorized entry, the BCM enters the alarm mode. The BCM activates the horns and exterior lamps for 30 seconds. This is followed by a three minute time-out with the horn no longer active. If no new intrusions are detected after the time-out, the horn is not active. The system must be disarmed or the intrusion condition removed after the time-out for the system to exit alarm mode.

Remote Control Door Lock Receiver

The keyless entry system can arm and disarm the content theft deterrent system. When the remote control door lock receiver receives a door lock or unlock signal from the transmitter, the remote control door lock receiver sends a message to the BCM via serial data to perform the appropriate arm/disarm functions.

Door Ajar Switches

The content theft deterrent system uses the door ajar switches as a status indicator to activate the alarm. The door ajar switches are monitored by the body control module via a discrete input from each door ajar switch. If the BCM receives a signal indicating a door is opened when the content theft deterrent system is armed, the BCM activates the alarm.

Hood Ajar Switch

The content theft deterrent system uses the hood ajar switch as a status indicator to activate the alarm. The BCM monitors the hood ajar switch via a discrete input from the switch. If the BCM receives a signal indicating the hood has been opened when the content theft deterrent system is armed, the BCM activates the alarm.

Rear Compartment Ajar Switch

The content theft deterrent system uses the rear compartment ajar switch as a status indicator to activate the alarm. The BCM monitors the rear compartment ajar switch via a discrete input from the switch. If the BCM receives a signal indicating the rear compartment has been opened when content theft deterrent system is armed, the BCM activates the alarm.

Inputs

The BCM monitors the following inputs for content theft deterrent:

- Door ajar switches
- Keyless entry transmitter LOCK/UNLOCK buttons; a message from the remote control door lock receiver
- Immobilizer status—The BCM uses the immobilizer status for disarming the system or silencing an alarm when the correct vehicle key is used to start the vehicle
- Rear compartment ajar switch
- Hood ajar switch

Outputs

The BCM controls the following for content theft deterrent:

- Horn relay
- Exterior lamps

Section 13

Seats

Seat Hardware, Trim, and Upholstery 13-3
Repair Instructions 13-3
Driver or Passenger Seat Removal and Installation 13-3
Driver or Passenger Seat Inner Adjuster Front Finish Cover Replacement 13-4
Driver or Passenger Seat Outer Adjuster Front Finish Cover Replacement 13-5
Front Seat Adjuster Replacement 13-6
Driver or Passenger Seat Adjuster Handle Knob Replacement 13-7
Front Seat Armrest Replacement 13-8
Driver or Passenger Seat Head Restraint Replacement 13-9
Driver or Passenger Seat Head Restraint Guide Replacement 13-10
Driver or Passenger Seat Cushion Frame Replacement 13-11
Front Seat Cushion Cover and Pad Replacement 13-12
Driver or Passenger Seat Cushion Pad Replacement 13-13
Driver or Passenger Seat Back Cover and Pad Replacement 13-14
Driver or Passenger Seat Back Cushion Frame Replacement 13-15
Front Seat Back Recliner Handle Replacement 13-16
Rear Seat Head Restraint Replacement 13-17
Rear Seat Head Restraint Guide Replacement 13-18
Rear Seat Back Bolster Replacement 13-19
Rear Seat Cushion Cover and Pad Replacement 13-20
Rear Seat Cushion Removal and Installation 13-21
Rear Seat Latch Knob Replacement 13-22
Rear Seat Back Cushion Latch Replacement 13-23
Rear Seat Back Cushion Removal and Installation (60 percent seat) 13-24
Rear Seat Back Cushion Removal and Installation (40 percent seat) 13-25
Rear Seat Back Cover Replacement 13-26

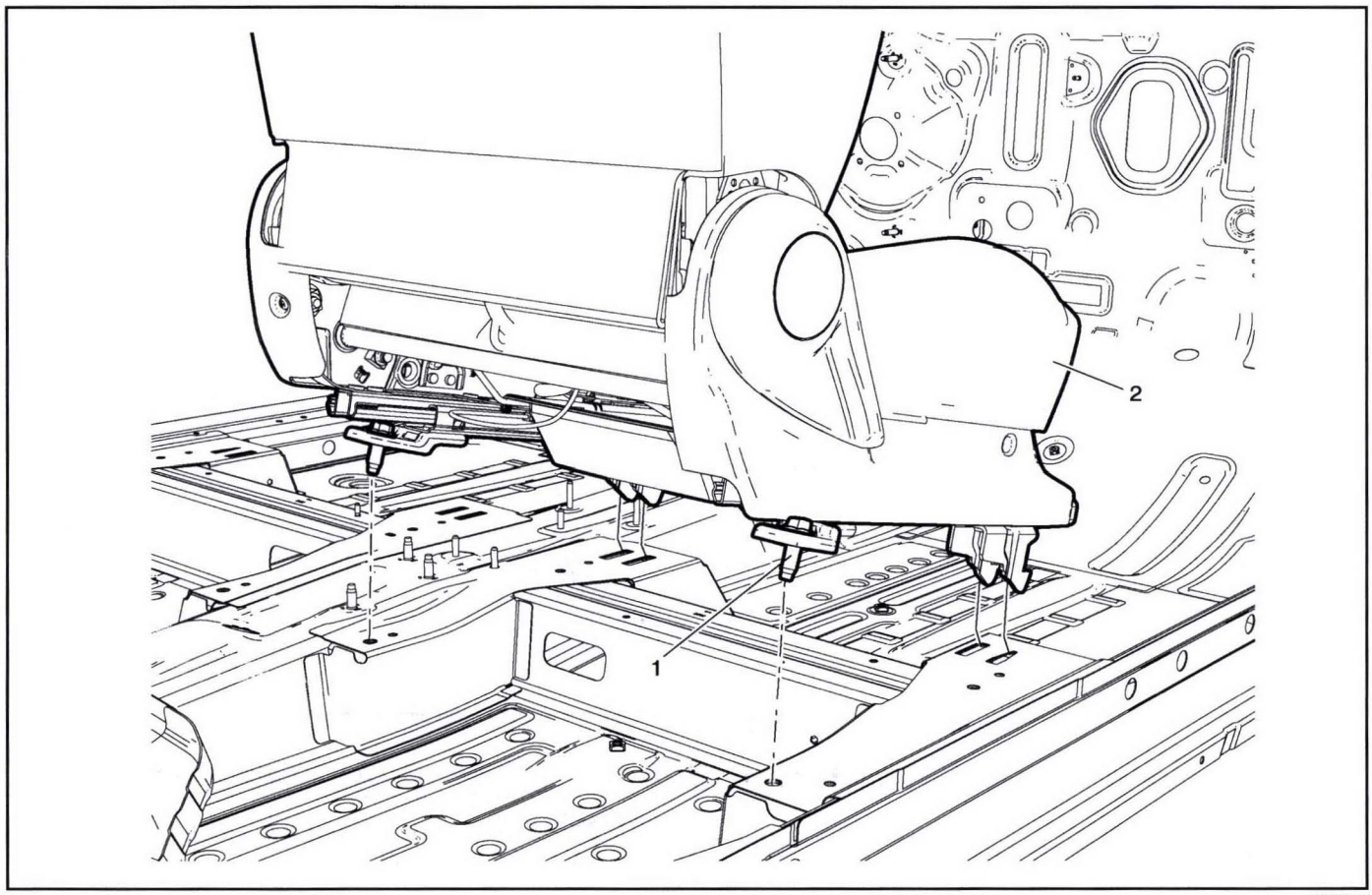
Seat Heating and Cooling 13-27
Schematic and Routing Diagrams 13-27
Heated/Cooled Seat Schematics 13-28
Diagnostic Information and Procedures 13-29
Symptoms - Seat Heating and Cooling 13-29
Front Heated Seat Malfunction 13-29
Repair Instructions 13-31
Front Seat Heater Switch Replacement 13-31
Driver or Passenger Seat Back Heater Replacement 13-32
Front Seat Cushion Heater Replacement 13-33
Description and Operation 13-34
Heated Seats Description and Operation 13-34

BLANK

Seat Hardware, Trim, and Upholstery

Repair Instructions

Driver or Passenger Seat Removal and Installation

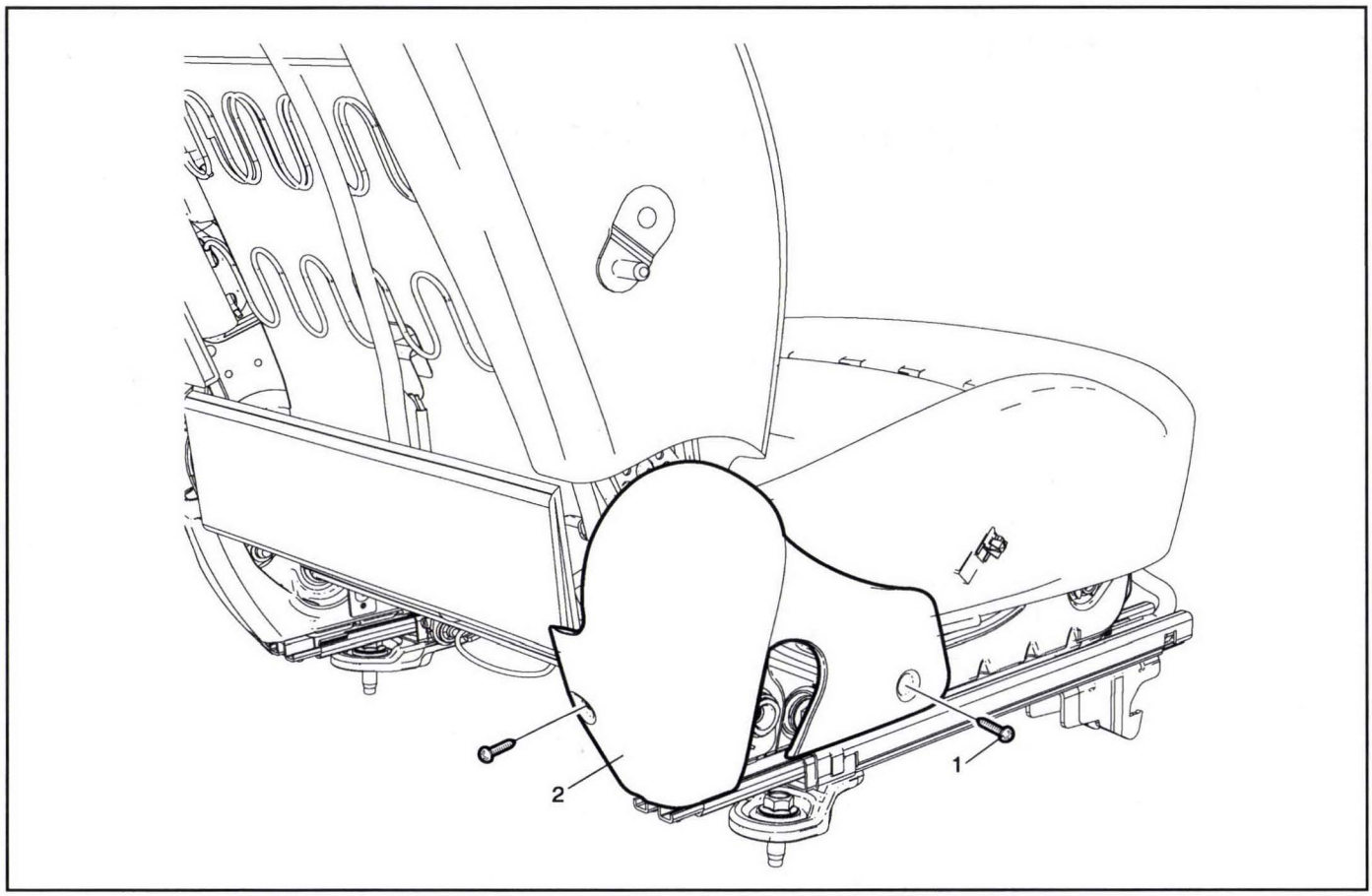


2309317

Driver or Passenger Seat Removal and Installation

Callout	Component Name
1	Front Seat Mounting Bolt (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tip:** Adjust the seat forward or rearward to access the nuts. **Tighten** 45 N•m (33 lb ft)
2	Seat Assembly **Procedure** Disconnect the electrical connectors.

Driver or Passenger Seat Inner Adjuster Front Finish Cover Replacement

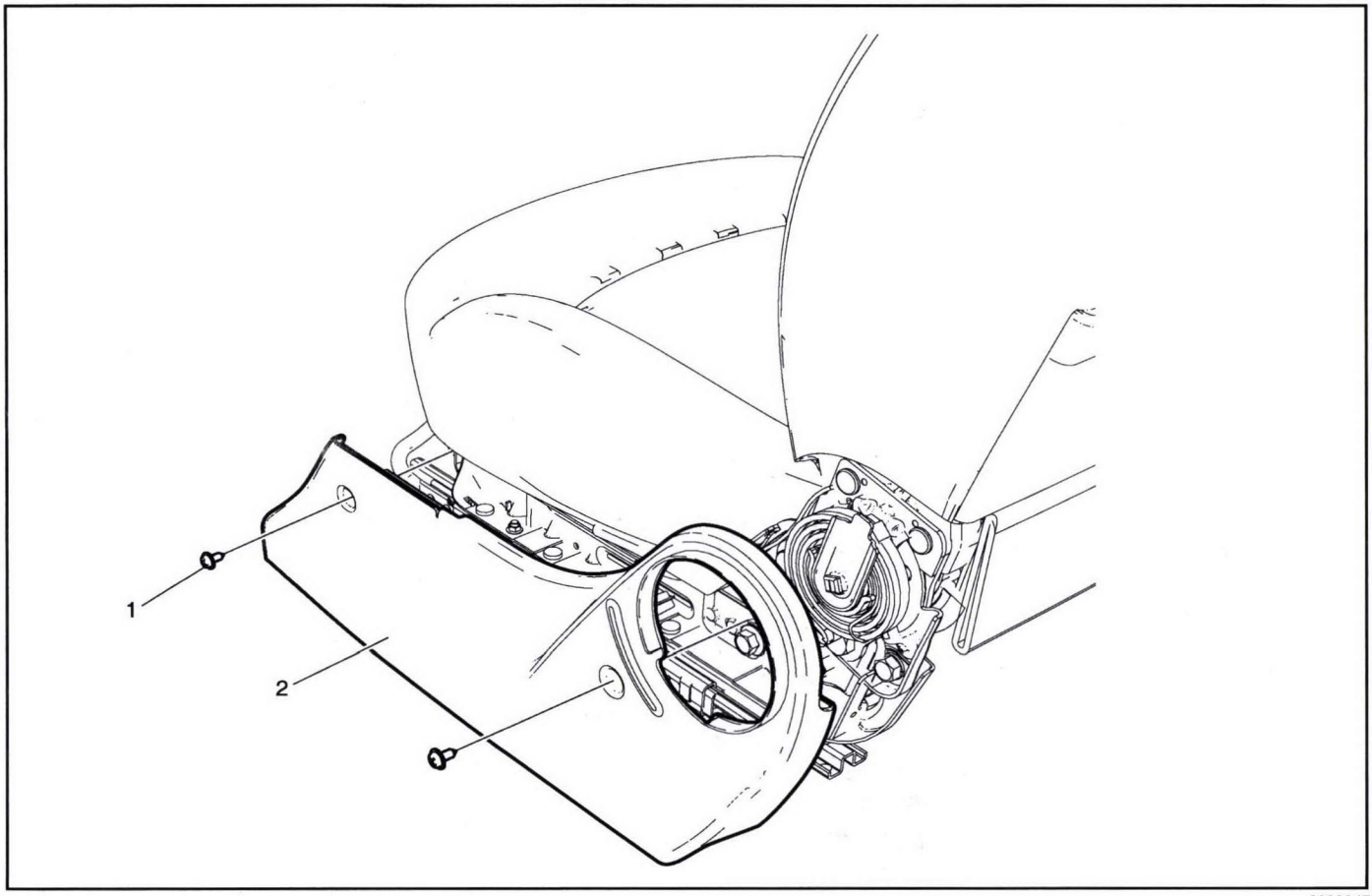


2309341

Driver or Passenger Seat Inner Adjuster Front Finish Cover Replacement

Callout	Component Name
1	Driver or Passenger Seat Inner Adjuster Front Finish Cover Fastener (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*. **Note:** Adjust the seat forward or rearward to access the nuts. **Tighten** 2.5N•m (22 lb in)
2	Driver or Passenger Seat Inner Adjuster Front Finish Cover **Procedure** Remove the seat inner adjuster finish cover by pulling upward.

Driver or Passenger Seat Outer Adjuster Front Finish Cover Replacement

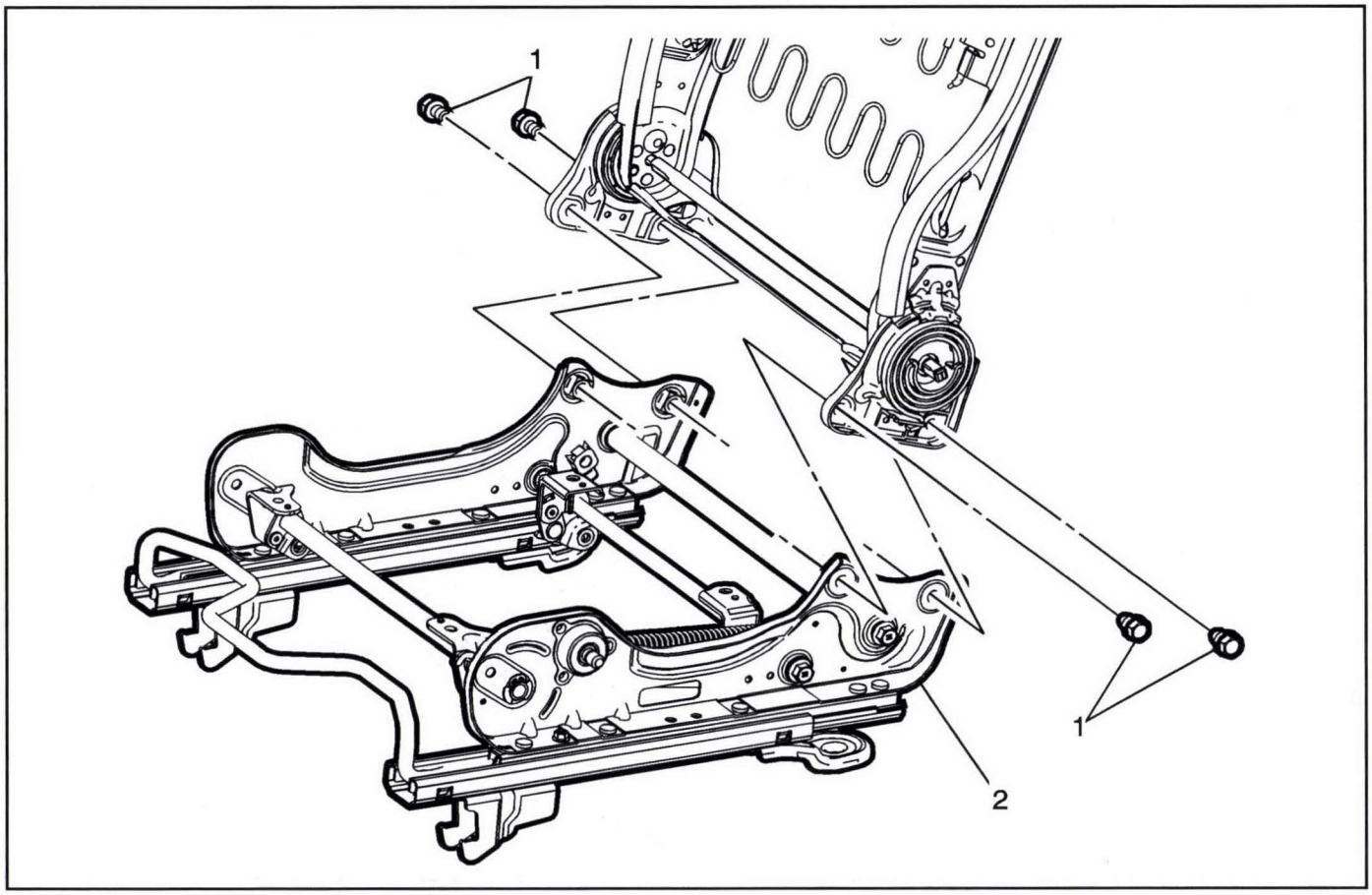


2309347

Driver or Passenger Seat Outer Adjuster Front Finish Cover Replacement

Callout	Component Name
Preliminary Procedure 1. Remove the front seat back recliner handle. Refer to *Front Seat Back Recliner Handle Replacement on page 13-16*. 2. Remove the driver or passenger seat adjuster handle knob. Refer to *Driver or Passenger Seat Adjuster Handle Knob Replacement on page 13-7*.	
1	Driver or Passenger Seat Outer Adjuster Front Finish Cover Screw (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 2.5N•m (22 lb in)
2	Driver or Passenger Seat Outer Adjuster Front Finish Cover

Front Seat Adjuster Replacement

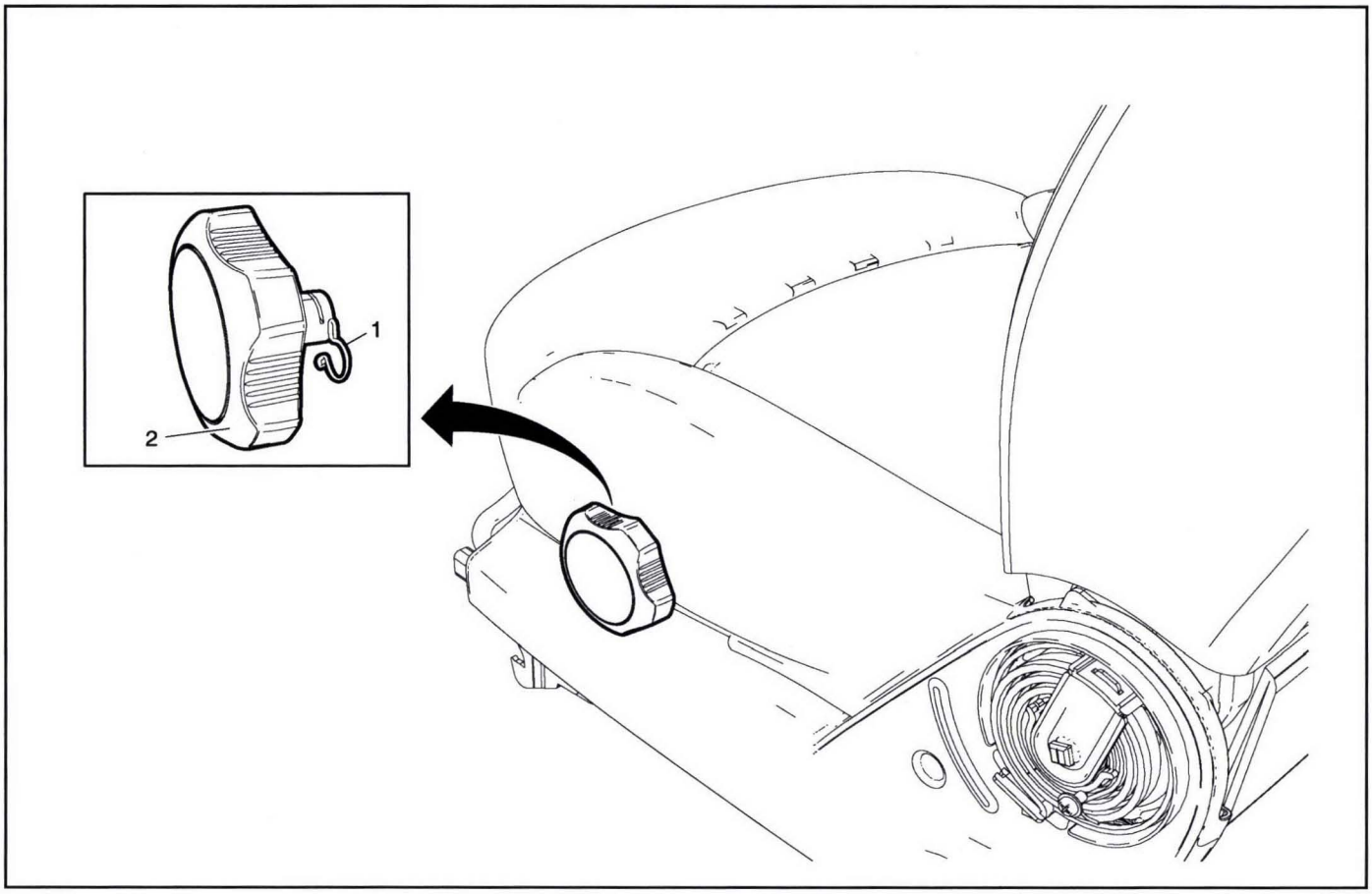


3021461

Front Seat Adjuster Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the driver or passenger seat. Refer to *Driver or Passenger Seat Removal and Installation on page 13-3*. 2. Remove the driver or passenger seat inner adjuster front finish cover. Refer to *Driver or Passenger Seat Inner Adjuster Front Finish Cover Replacement on page 13-4*. 3. Remove the driver or passenger seat outer adjuster front finish cover. Refer to *Driver or Passenger Seat Outer Adjuster Front Finish Cover Replacement on page 13-5*. 4. Remove the front seat cushion cover. Refer to *Front Seat Cushion Cover and Pad Replacement on page 13-12*.	
1	Front Seat Adjuster Bolt (Qty: 4) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 45 N•m (33 lb ft)
2	Front Seat Adjuster **Procedure** 1. Disconnect electrical connectors as needed. 2. If replacing with a new front seat adjuster, transfer components as necessary.

Driver or Passenger Seat Adjuster Handle Knob Replacement

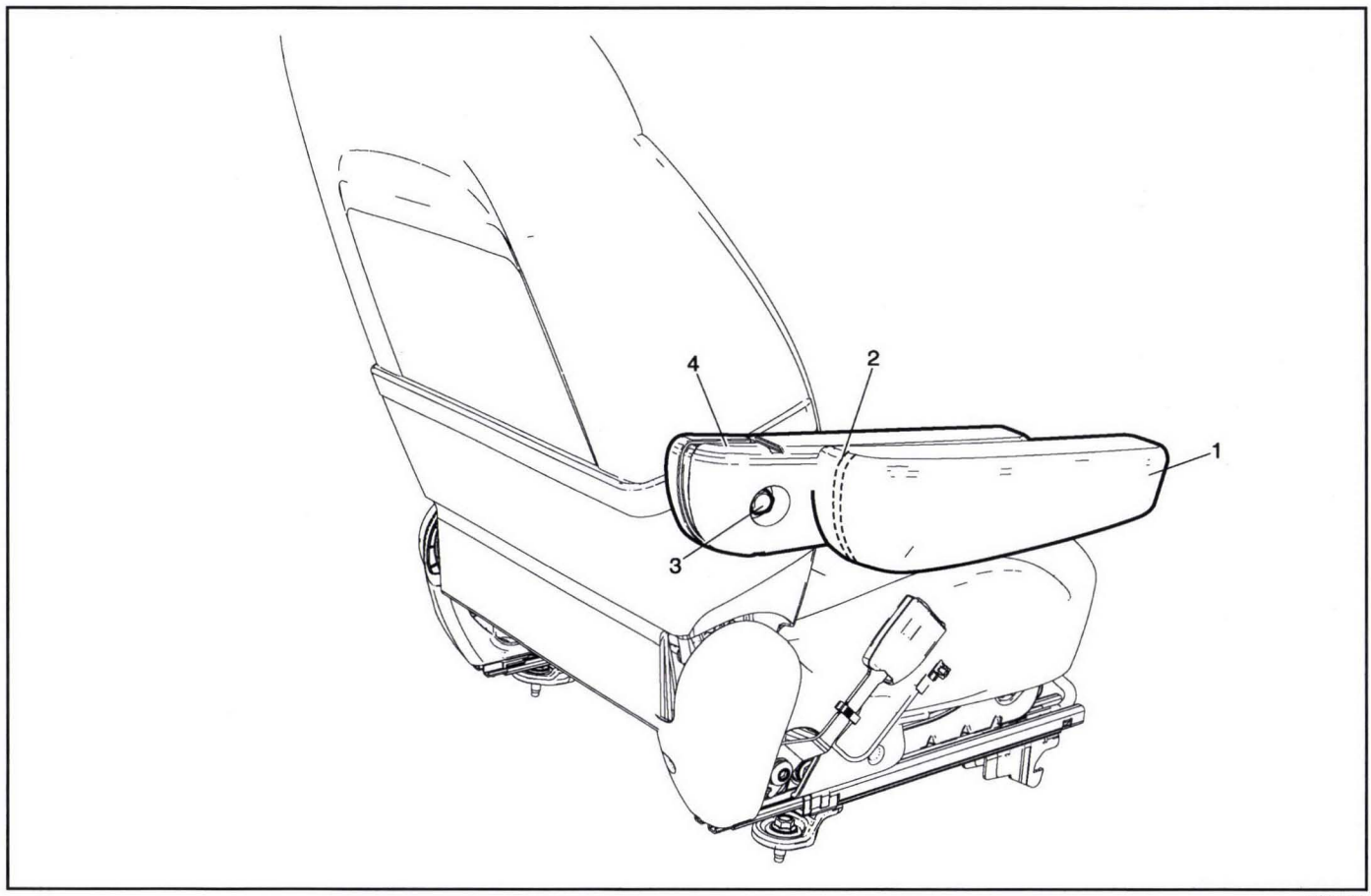


2309345

Driver or Passenger Seat Adjuster Handle Knob Replacement

Callout	Component Name
1	Front Seat Adjuster Handle Knob Clamp **Tip:** Use a proper tool to release adjuster handle knob clamp.
2	Front Seat Adjuster Handle Knob

Front Seat Armrest Replacement

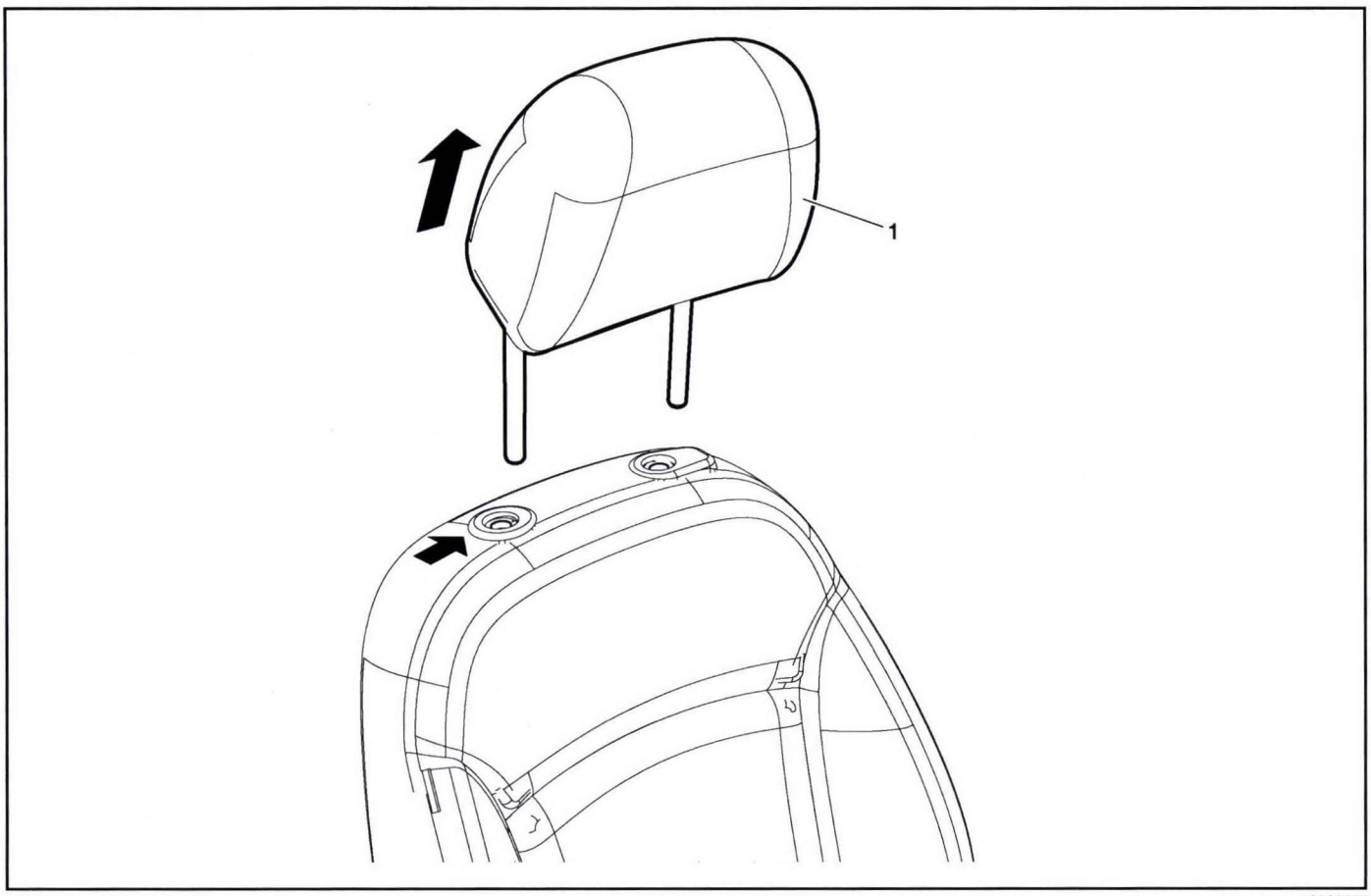


2309328

Front Seat Armrest Replacement

Callout	Component Name
1	Front Seat Armrest Cover
2	Front Seat Armrest Cover Zipper **Procedure** Open the zipper to access the front seat armrest mounting bolt.
3	Front Seat Armrest Mounting Bolt (Qty: 1) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 45 N•m (33 lb ft)
4	Front Seat Armrest Assembly

Driver or Passenger Seat Head Restraint Replacement

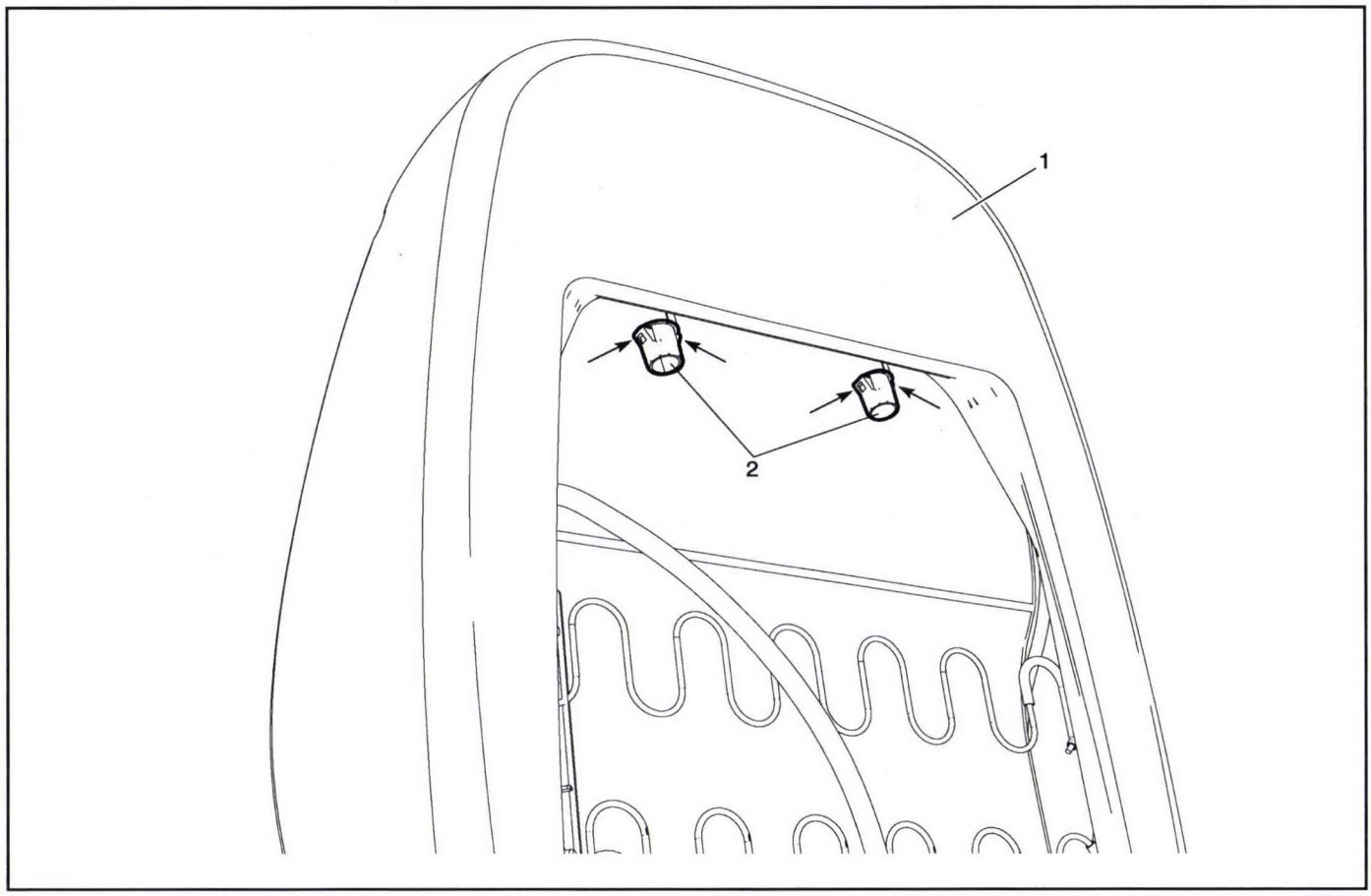


2309327

Driver or Passenger Seat Head Restraint Replacement

Callout	Component Name
1	Front Seat Head Restraint **Procedure** 1. Raise the headrest to the full upward position. 2. Depress the flush button on the head restraint guide. 3. Remove the head restraint by pulling up on the restraint.

Driver or Passenger Seat Head Restraint Guide Replacement

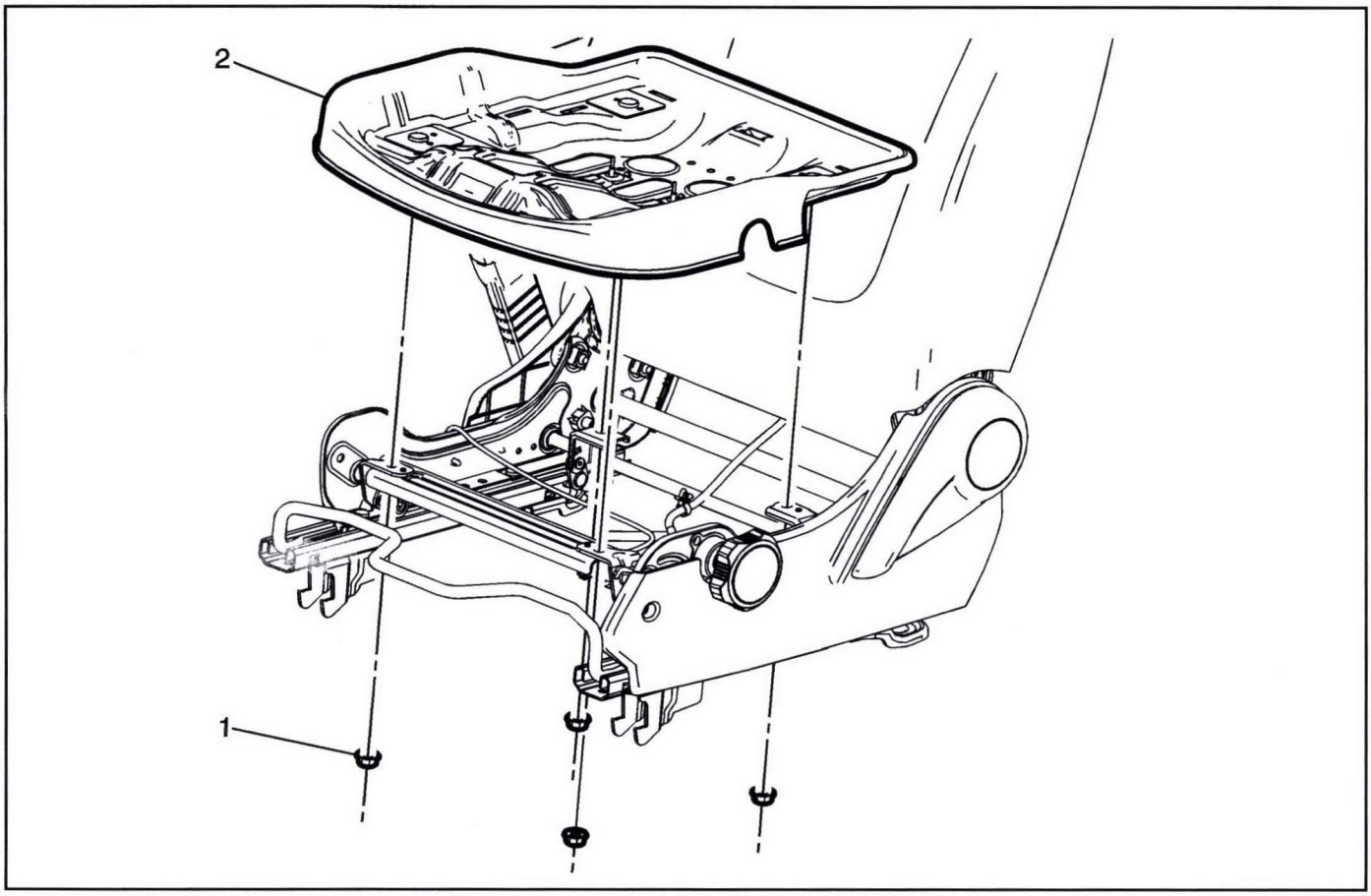


2309334

Driver or Passenger Seat Head Restraint Guide Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the hog rings at the rear part of the front seat back. Refer to *Driver or Passenger Seat Back Cover and Pad Replacement on page 13-14*. 2. Remove the front seat back cushion cover and pad to access the head restraint guide.	
1	Front Seat Back Cushion Pad
2	Front Seat Head Restraint Guide

Driver or Passenger Seat Cushion Frame Replacement

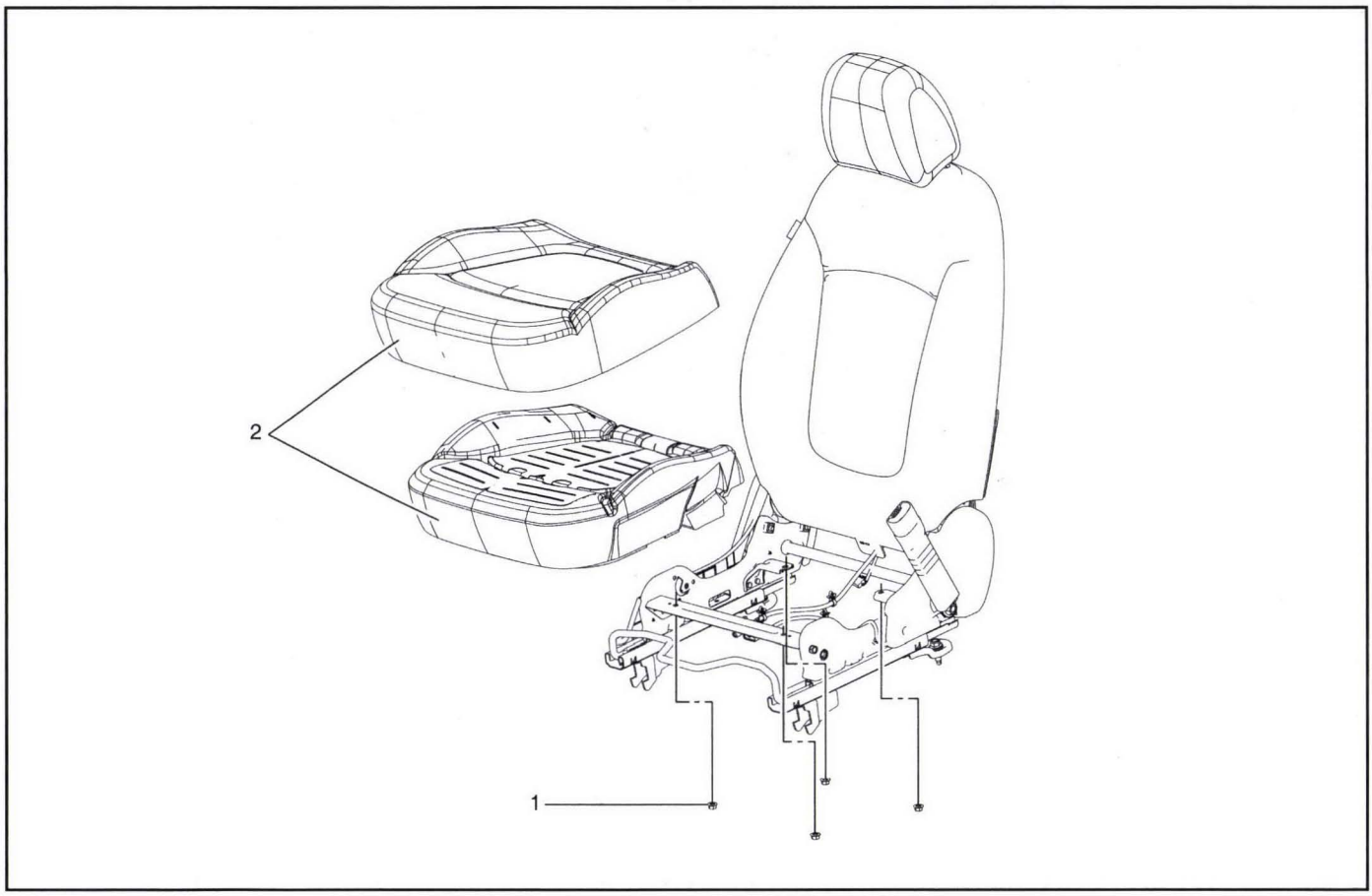


3021462

Driver or Passenger Seat Cushion Frame Replacement

Callout	Component Name
Preliminary Procedure Remove the front seat cushion cover and pad. Refer to *Front Seat Cushion Cover and Pad Replacement on page 13-12*.	
1	Driver or Passenger Seat Cushion Frame Fastener (Qty: 4) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 35 N•m 26 lb ft)
2	Driver or Passenger Seat Cushion Frame

Front Seat Cushion Cover and Pad Replacement

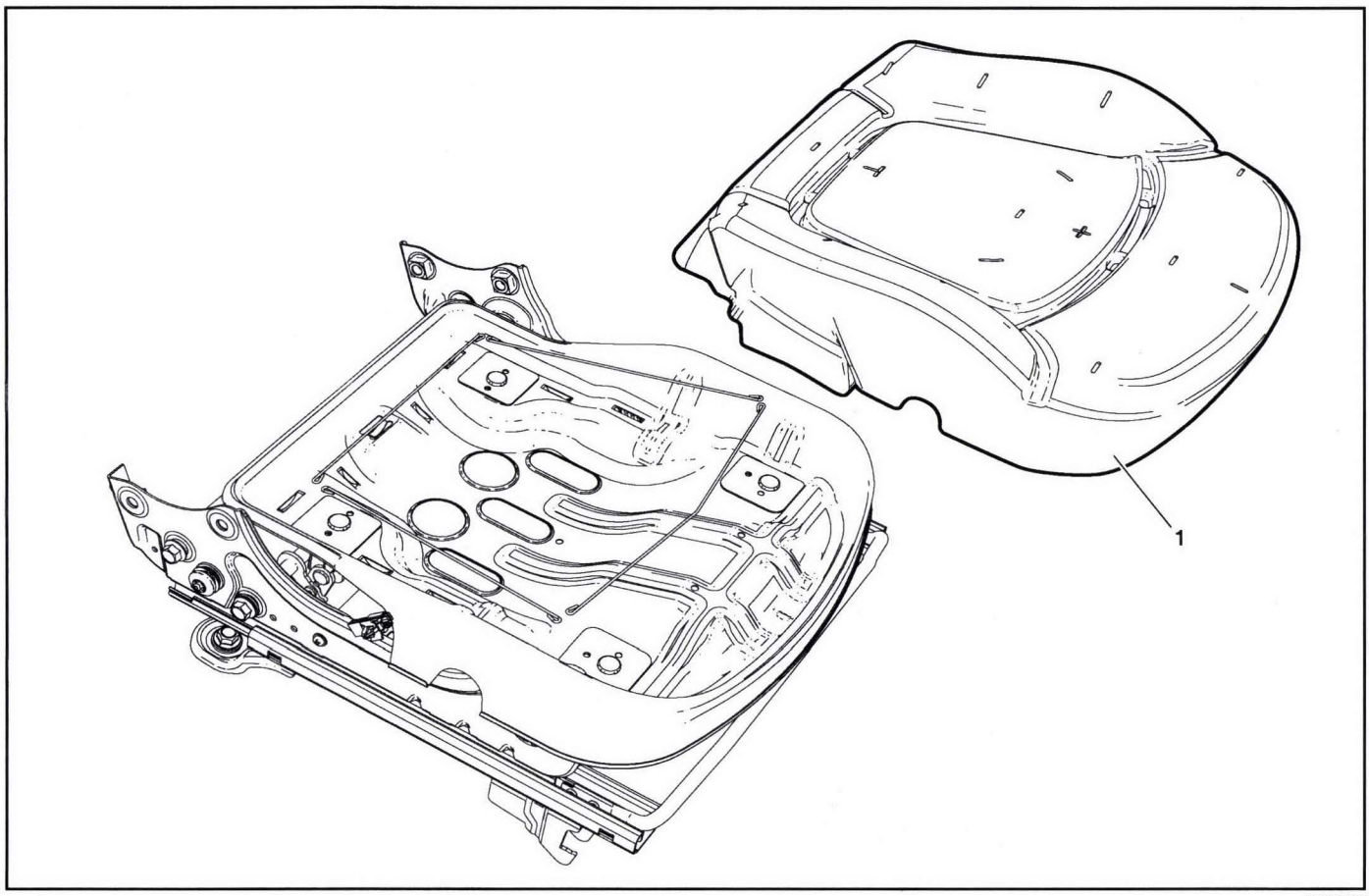


2829154

Front Seat Cushion Cover and Pad Replacement

Callout	Component Name
Preliminary Procedure Remove the front seat. Refer to *Driver or Passenger Seat Removal and Installation on page 13-3*.	
1	Front Seat Cushion Nut (Qty: 4) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 30.5 N•m (22.5 lb ft)
2	Front Seat Cushion Cover and Pad ***Warning: Replace the passenger presence system as a complete assembly to prevent possible injury to the occupant. The bladder, the pressure sensor, the seat cushion, and the control module are assembled and calibrated as a unit. Using only some of the components in the service kit will cause the passenger presence system to operate improperly.*** **Procedure** 1. Disconnect the electrical connectors that attach to the seat cushion, if equipped. 2. Remove the seat cushion cover and pad from the seat cushion frame as an assembly. 3. Disengage the j-channel retainers from the seat cushion frame. 4. Remove the hog rings. 5. Pull the cover away from the pad to disengage the hog rings. 6. If working on the passenger seat, re-zero the inflatable restraint passenger presence system whenever the seat cushion or any component of the passenger presence system is removed. Refer to *Passenger Presence System Rezeroing on page 12-147*.

Driver or Passenger Seat Cushion Pad Replacement

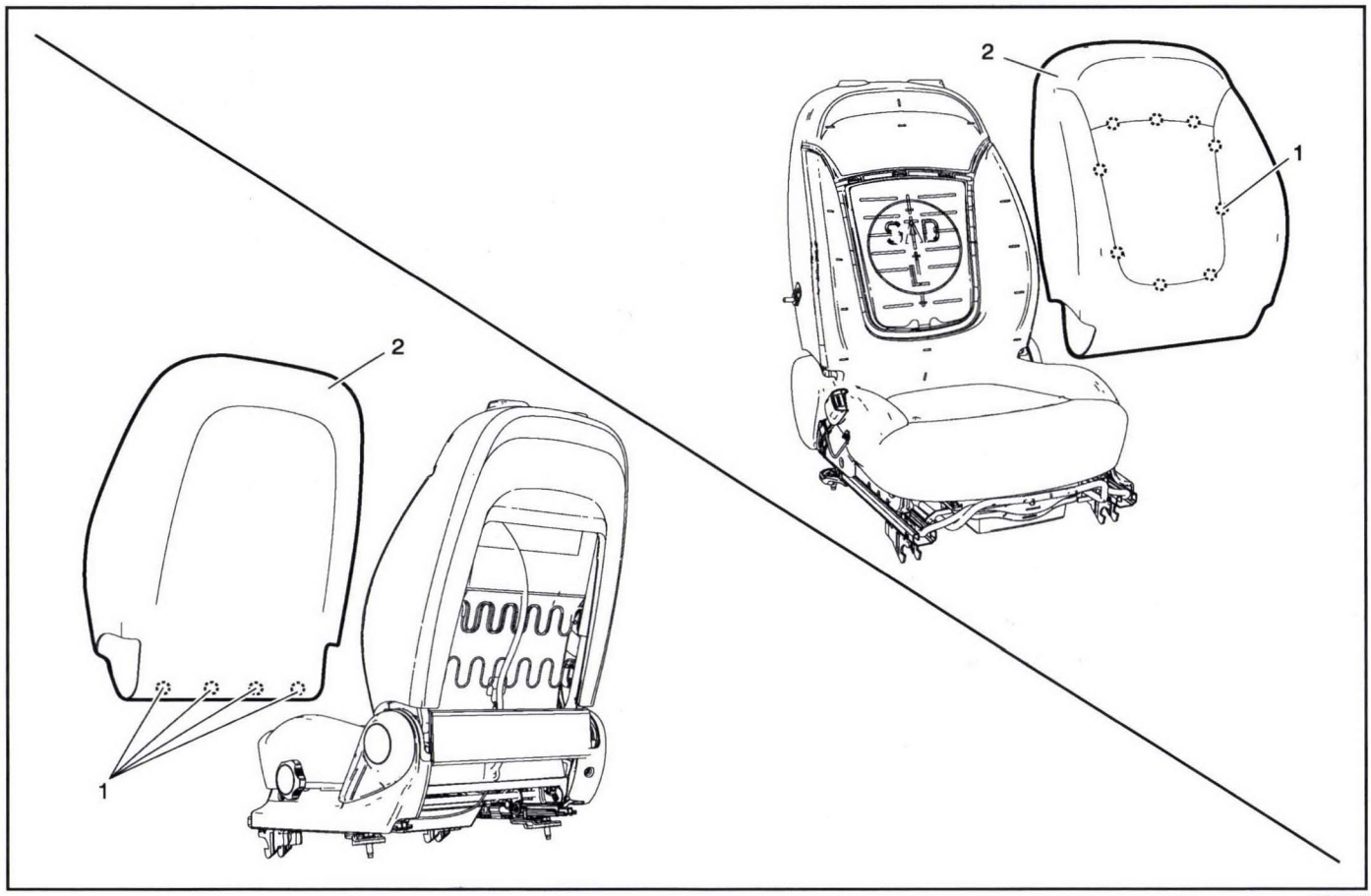


2309365

Driver or Passenger Seat Cushion Pad Replacement

Callout	Component Name
Preliminary Procedure Remove the front seat cushion cover and pad. Refer to *Front Seat Cushion Cover and Pad Replacement on page 13-12*.	
1	Front Seat Cushion Pad **Procedure** If necessary, remove the seat cushion heating mat. Refer to *Front Seat Cushion Heater Replacement on page 13-33*.

Driver or Passenger Seat Back Cover and Pad Replacement

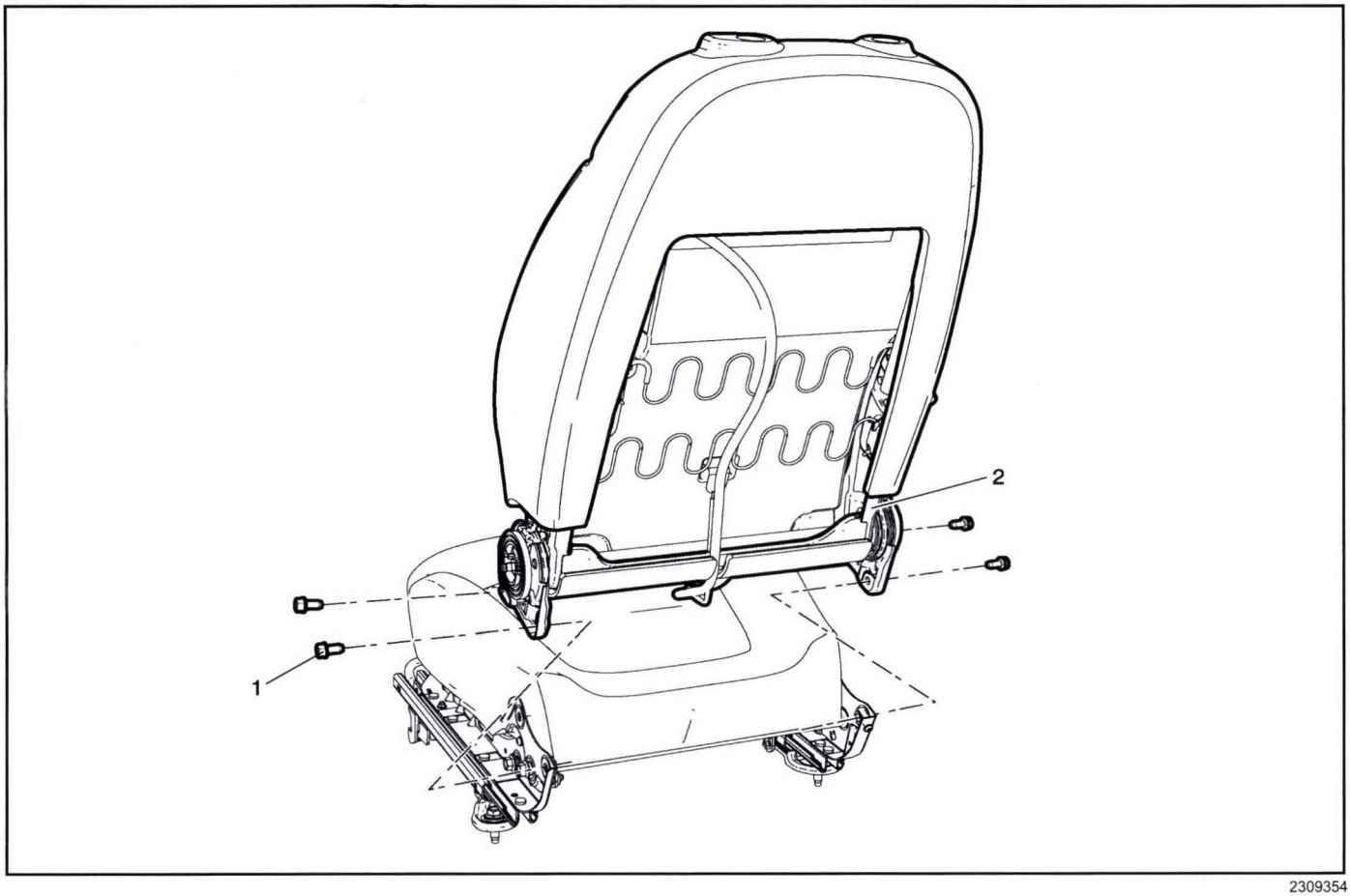


2309330

Driver or Passenger Seat Back Cover and Pad Replacement

Callout	Component Name
Preliminary Procedure Remove the front seat armrest. Refer to *Front Seat Armrest Replacement on page 13-8*.	
1	Driver or Passenger Seat Back Cushion Cover Hog Rings (Qty: 13) **Tip:** Begin at the rear part of the front seat back cushion cover, release the hog rings.
2	Driver or Passenger Seat Back Cushion Cover

Driver or Passenger Seat Back Cushion Frame Replacement

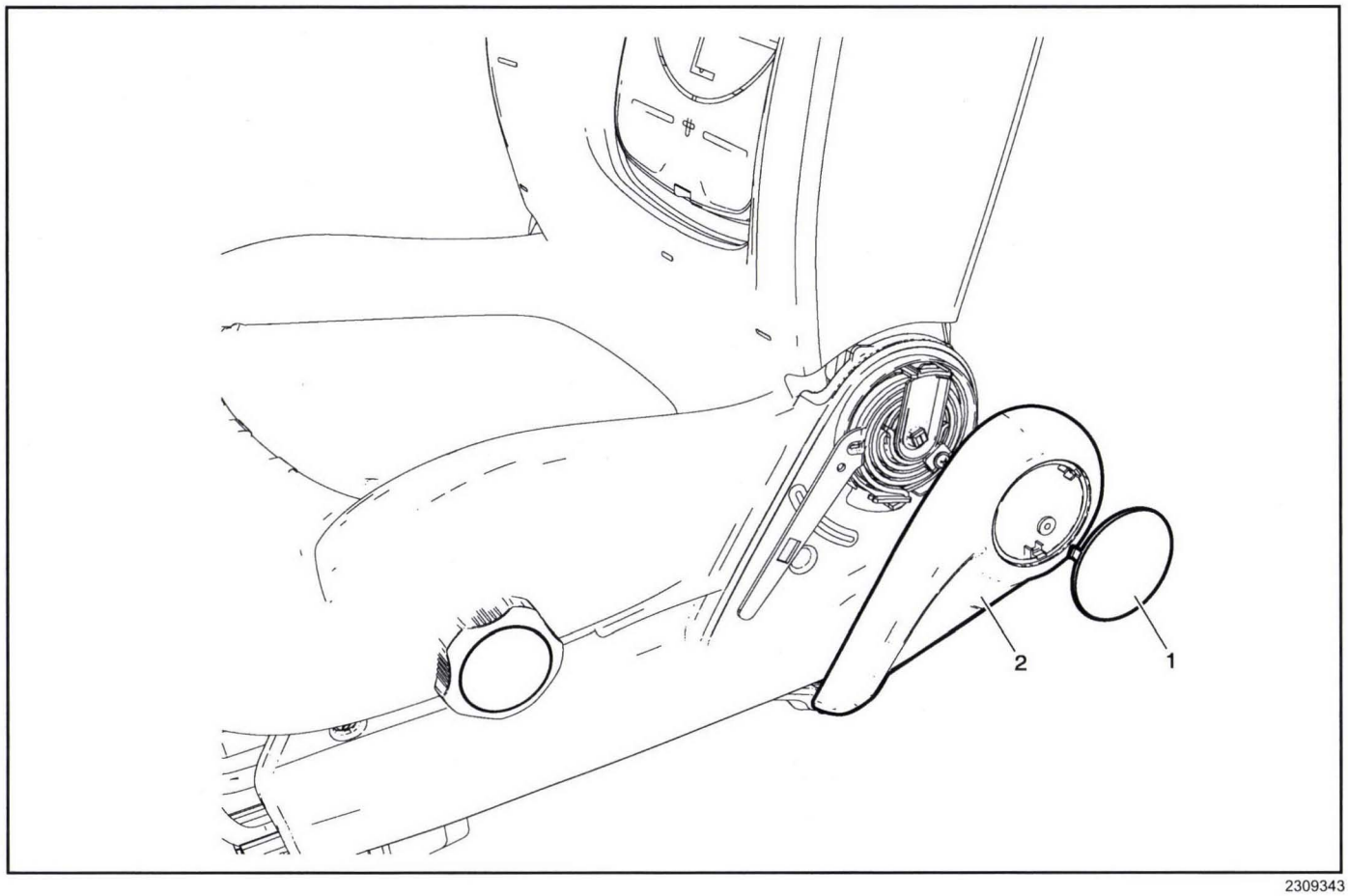


2309354

Driver or Passenger Seat Back Cushion Frame Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the front seat. Refer to *Driver or Passenger Seat Removal and Installation on page 13-3*. 2. Remove the driver or passenger seat inner adjuster front finish cover. Refer to *Driver or Passenger Seat Inner Adjuster Front Finish Cover Replacement on page 13-4*. 3. Remove the driver or passenger seat outer adjuster front finish cover. Refer to *Driver or Passenger Seat Outer Adjuster Front Finish Cover Replacement on page 13-5*.	
1	Front Seat Back Cushion Frame Bolt (Qty: 4) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 45 N•m (33 lb ft)
2	Front Seat Back Cushion Frame **Procedure** 1. Disconnect electrical connectors as needed. 2. Remove the inflatable restraint side impact module. Refer to *Front Seat Outboard Seat Back Airbag Replacement on page 12-164*. 3. If replacing with a new front seat back frame, transfer components as necessary.

Front Seat Back Recliner Handle Replacement

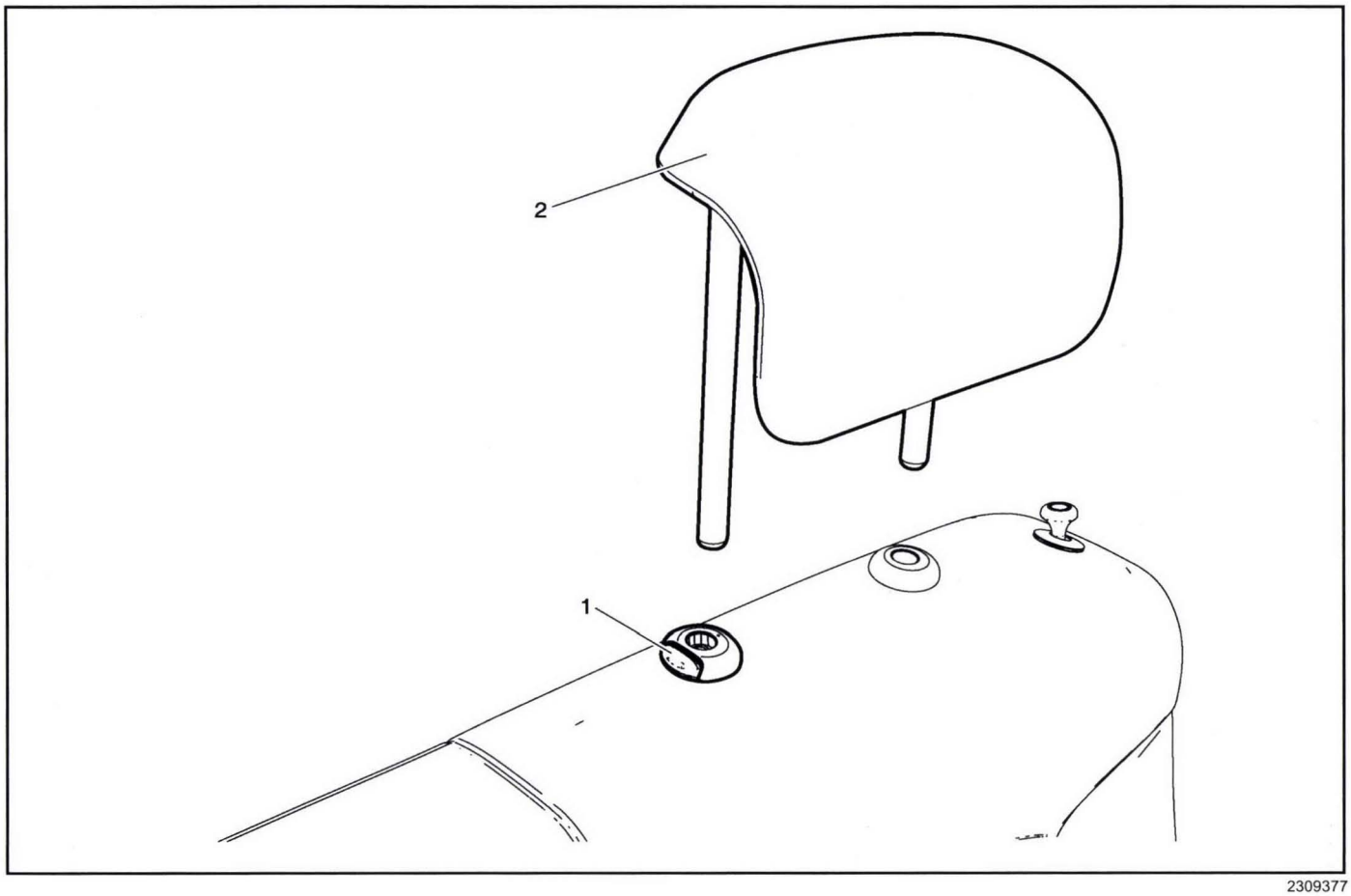


2309343

Front Seat Back Recliner Handle Replacement

Callout	Component Name
1	Front Seat Recliner Handle Cover **Procedure** Pull the handle cover away from the seat to remove.
2	Front Seat Recliner Handle **Procedure** Pull the handle away from the seat to remove.

Rear Seat Head Restraint Replacement

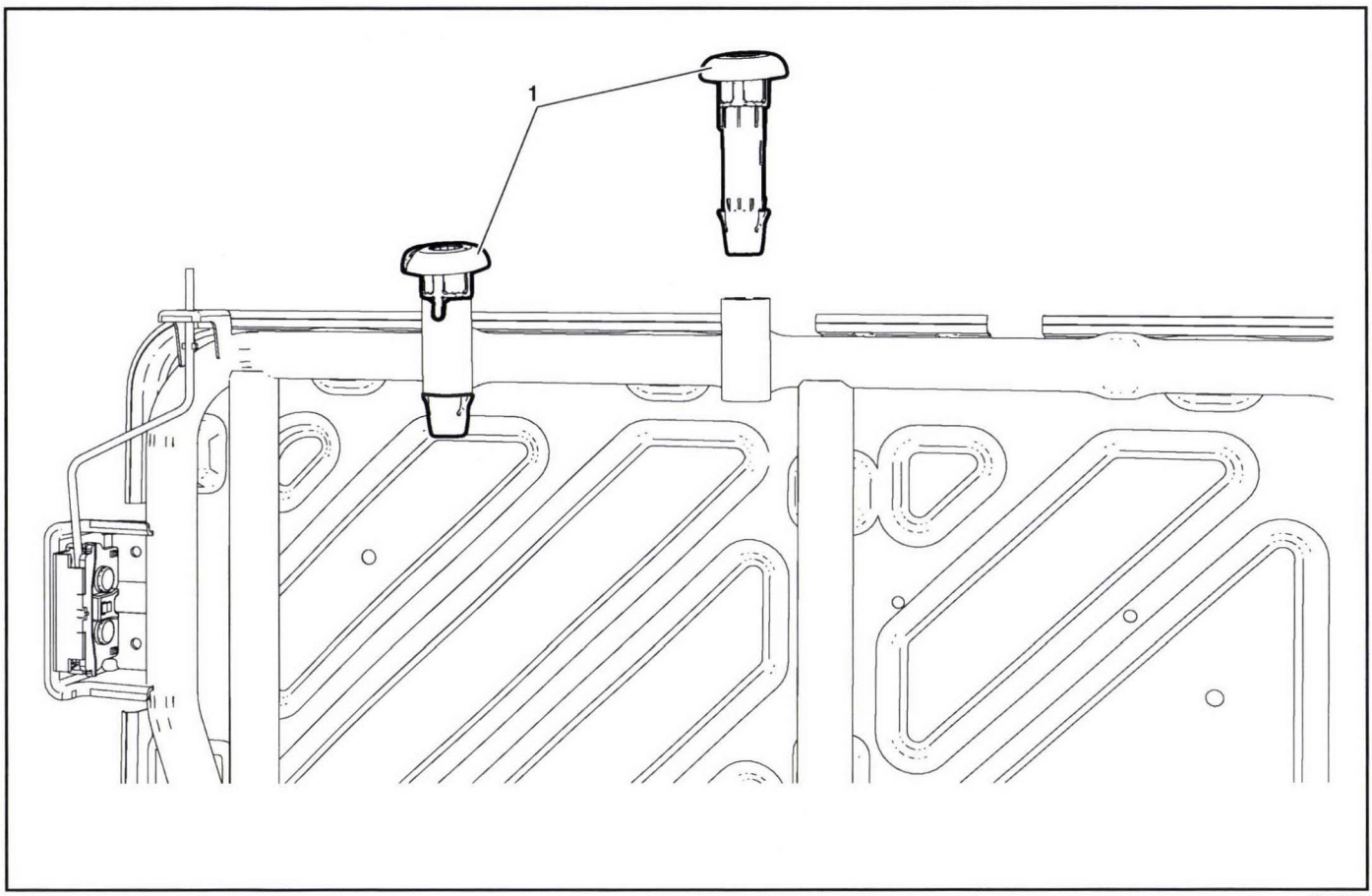


2309377

Rear Seat Head Restraint Replacement

Callout	Component Name
1	Rear Seat Head Restraint Flush Button **Procedure** Push the flush button and remove the head restraint.
2	Rear Seat Head Restraint

Rear Seat Head Restraint Guide Replacement

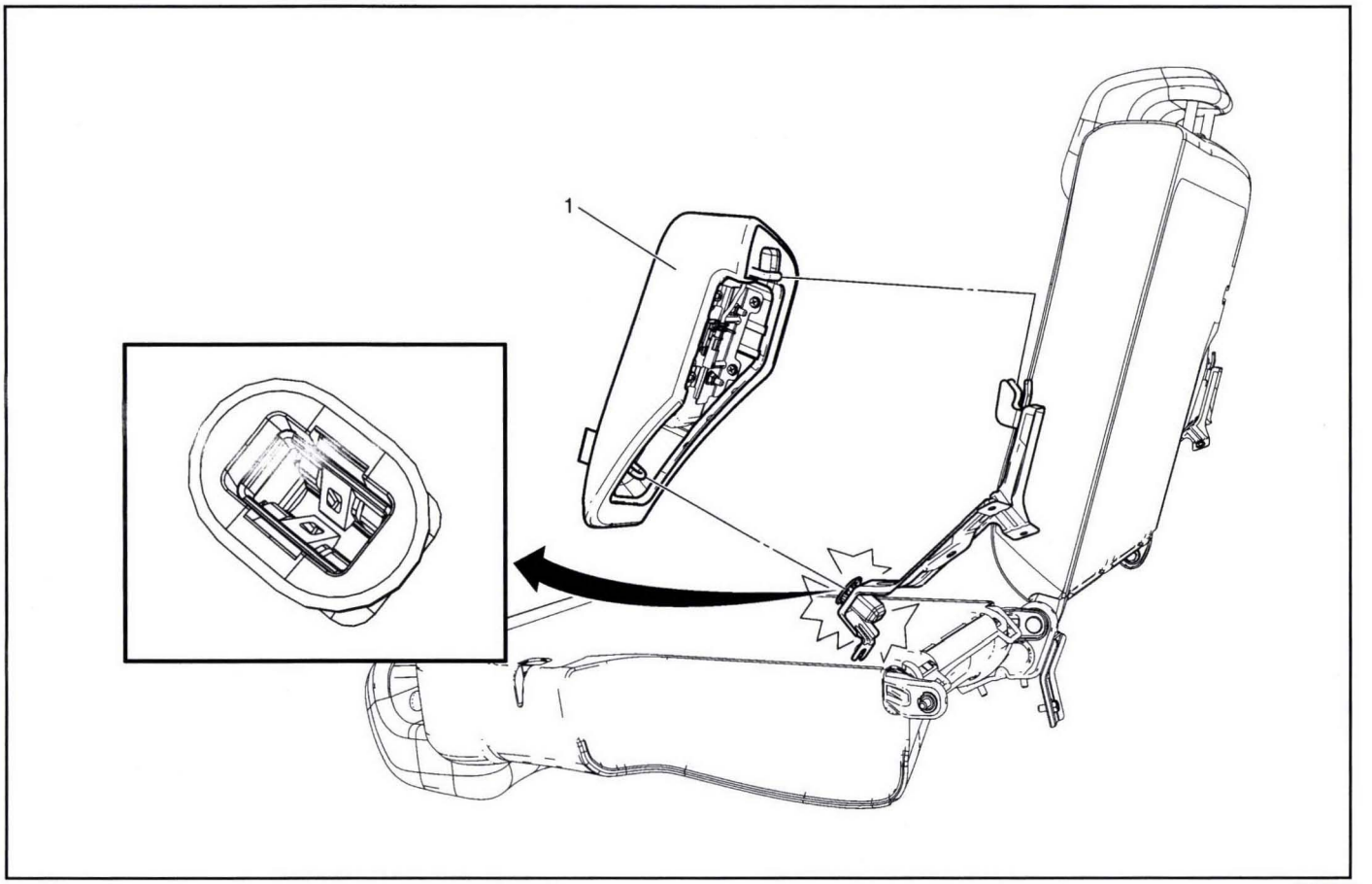


2309381

Rear Seat Head Restraint Guide Replacement

Callout	Component Name
Preliminary Procedure Remove rear seat back cover. Refer to *Rear Seat Back Cover Replacement on page 13-26*.	
1	Rear Seat Head Restraint Guide **Procedure** Unclip the rear seat head restraint guide.

Rear Seat Back Bolster Replacement

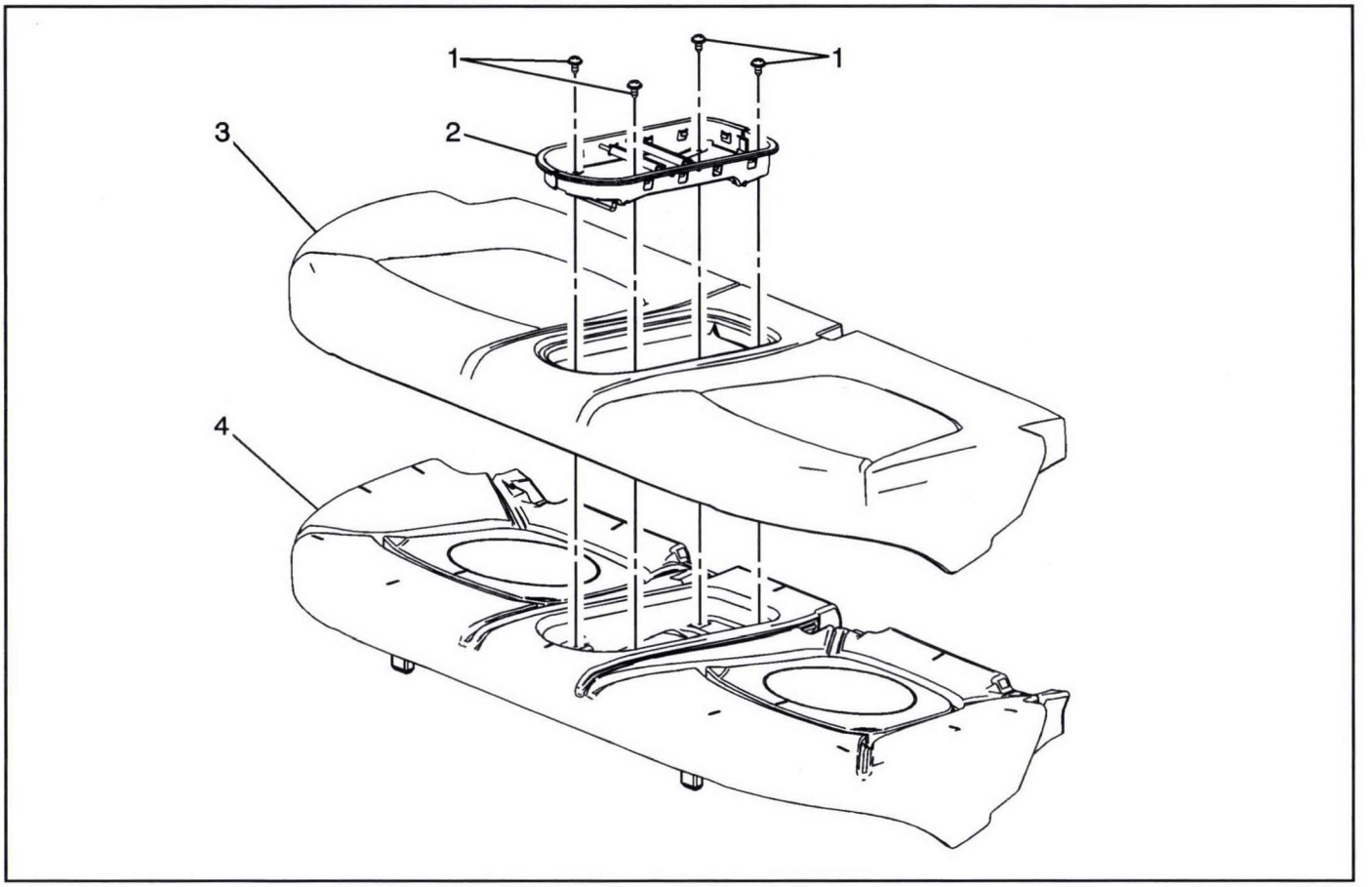


2754245

Rear Seat Back Bolster Replacement

Callout	Component Name
1	Rear Seat Back Cushion Bolster ***Warning: Refer to SIR Warning on page 0-7.*** ***Warning: Do not repair or replace the seat stitching or seams in the seat back trim cover with an internal mounted seat side airbag module. Replace the complete seat back trim cover from the OEM. Non-OEM seat stitching may cause improper airbag deployment which could result in personal injury.*** **Procedure** 1. Disable the SIR system. Refer to *SIR Disabling and Enabling on page 12-151*. 2. Fold rear seat back cushion down. 3. Pull the lower seat back cushion bolster forward. **Note:** Use a flat-bladed screwdriver to aid in releasing the retainer from the bolster retaining bar. 4. Pull the seat back cushion bolster up. 5. Disconnect the electrical connector. 6. Remove rear seat back cushion bolster. 7. Remove the rear seat side inflatable module. Refer to *Rear Seat Bolster Airbag Replacement on page 12-165*.

Rear Seat Cushion Cover and Pad Replacement

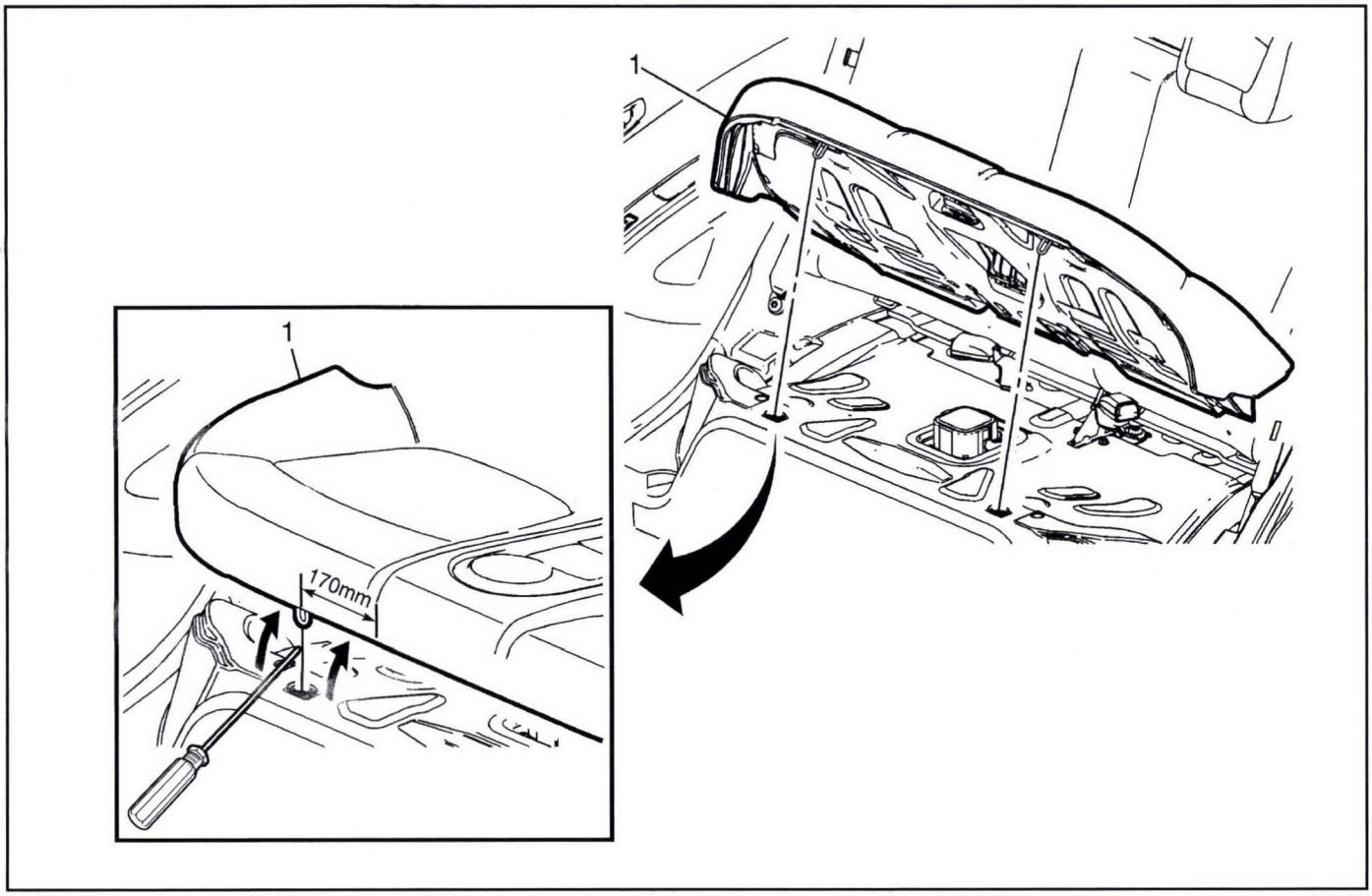


3021439

Rear Seat Cushion Cover and Pad Replacement

Callout	Component Name
Preliminary Procedure 1. Remove the rear seat cushion. Refer to *Rear Seat Cushion Removal and Installation on page 13-21*. 2. Remove the rear seat cup holder. Refer to *Rear Seat Cup Holder Replacement on page 2-56*.	
1	Rear Seat Cup Holder Support Bracket Fastener (Qty: 4) **Caution:** Refer to *Fastener Caution on page 0-8*.
2	Rear Seat Cup Holder Support Bracket
3	Rear Seat Cushion Cover **Procedures** 1. Remove the hog rings that secure the rear seat cushion cover to the pad. 2. Pull the cover away from the pad to disengage any retainers. **Note:** When installing the rear seat cushion cover, pull the cover tightly in all corners to ensure that no creasing occurs.
4	Rear Seat Cushion Pad

Rear Seat Cushion Removal and Installation

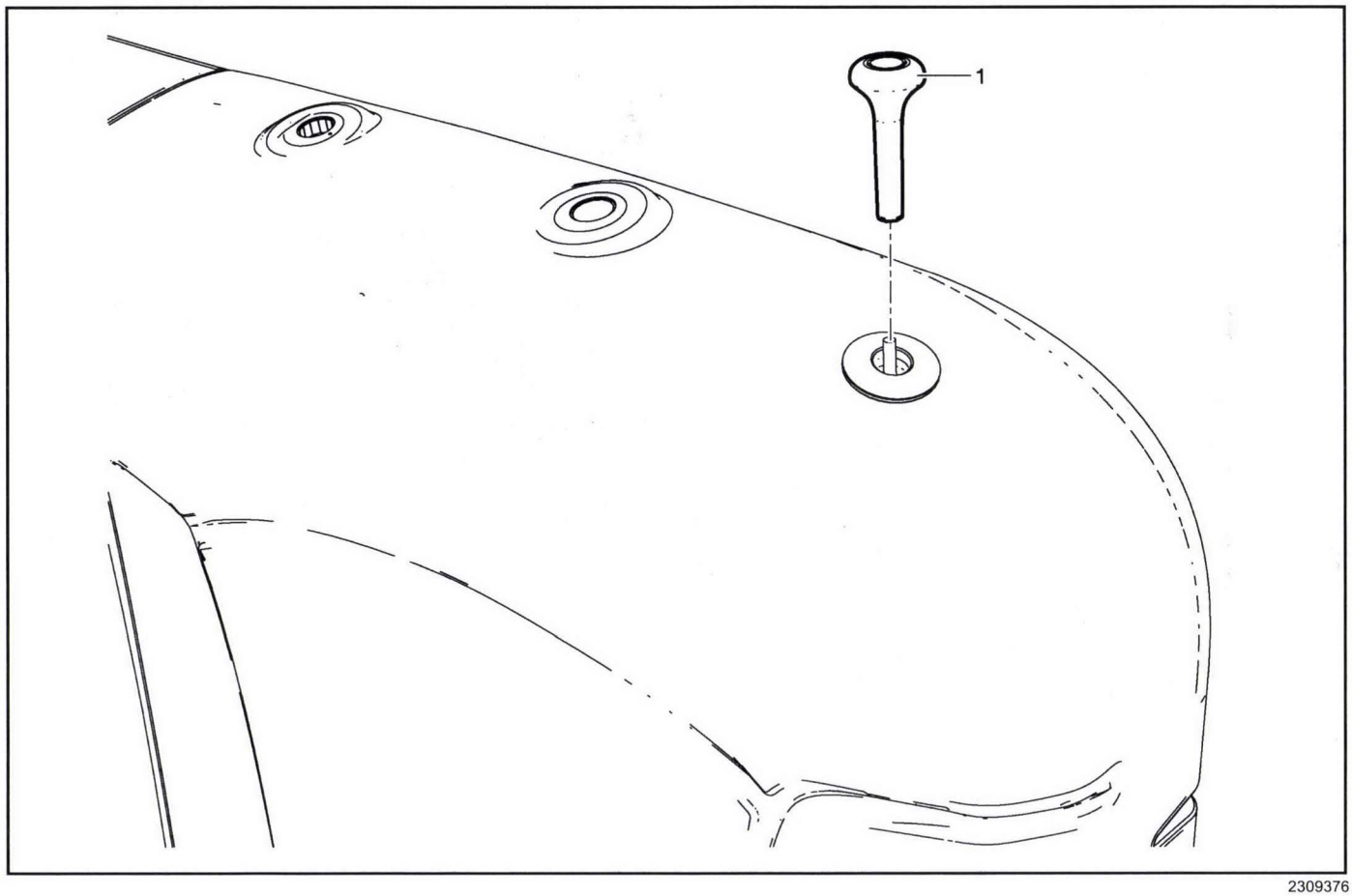


3319688

Rear Seat Cushion Removal and Installation

Callout	Component Name
1	Rear Seat Cushion **Note:** Position a large flat-head screwdriver on the side of the floor retainers in the designated areas before lifting up on the cushion. **Procedure** 1. Using a flat-head screwdriver, lift up on the front of the seat cushion to disengage the cushion from the floor retainers. 2. Push down on the rear of the seat to unhook the cushion wire from the lower cross bar hinges. 3. After the removal of the rear seat cushion, visually inspect the floor retainers for bending or breaking before reinstallation. 4. Replace the floor retainers as necessary.

Rear Seat Latch Knob Replacement

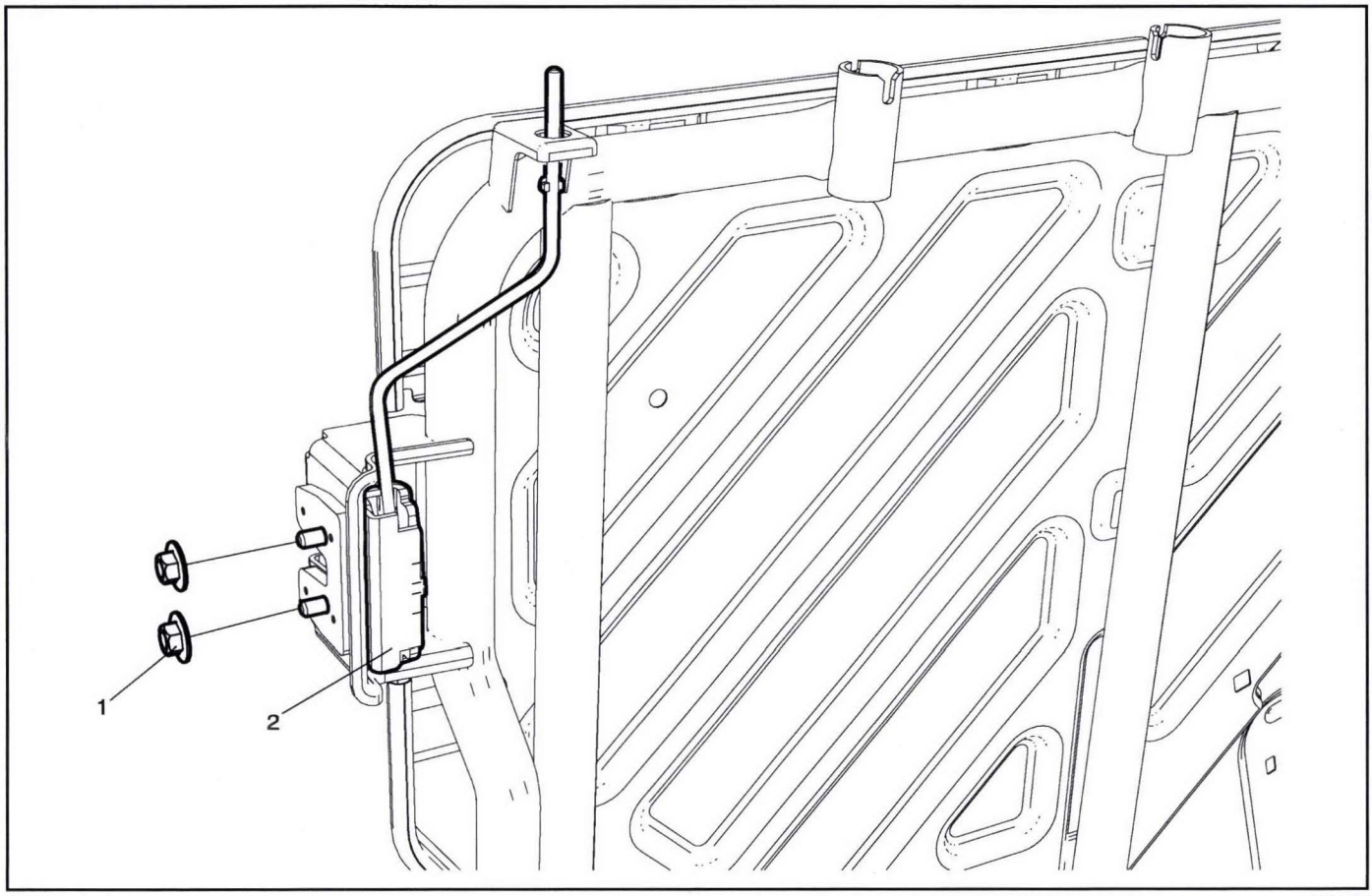


2309376

Rear Seat Latch Knob Replacement

Callout	Component Name
1	Rear Seat Latch Knob **Procedure** Turn the latch knob clockwise for removal.

Rear Seat Back Cushion Latch Replacement

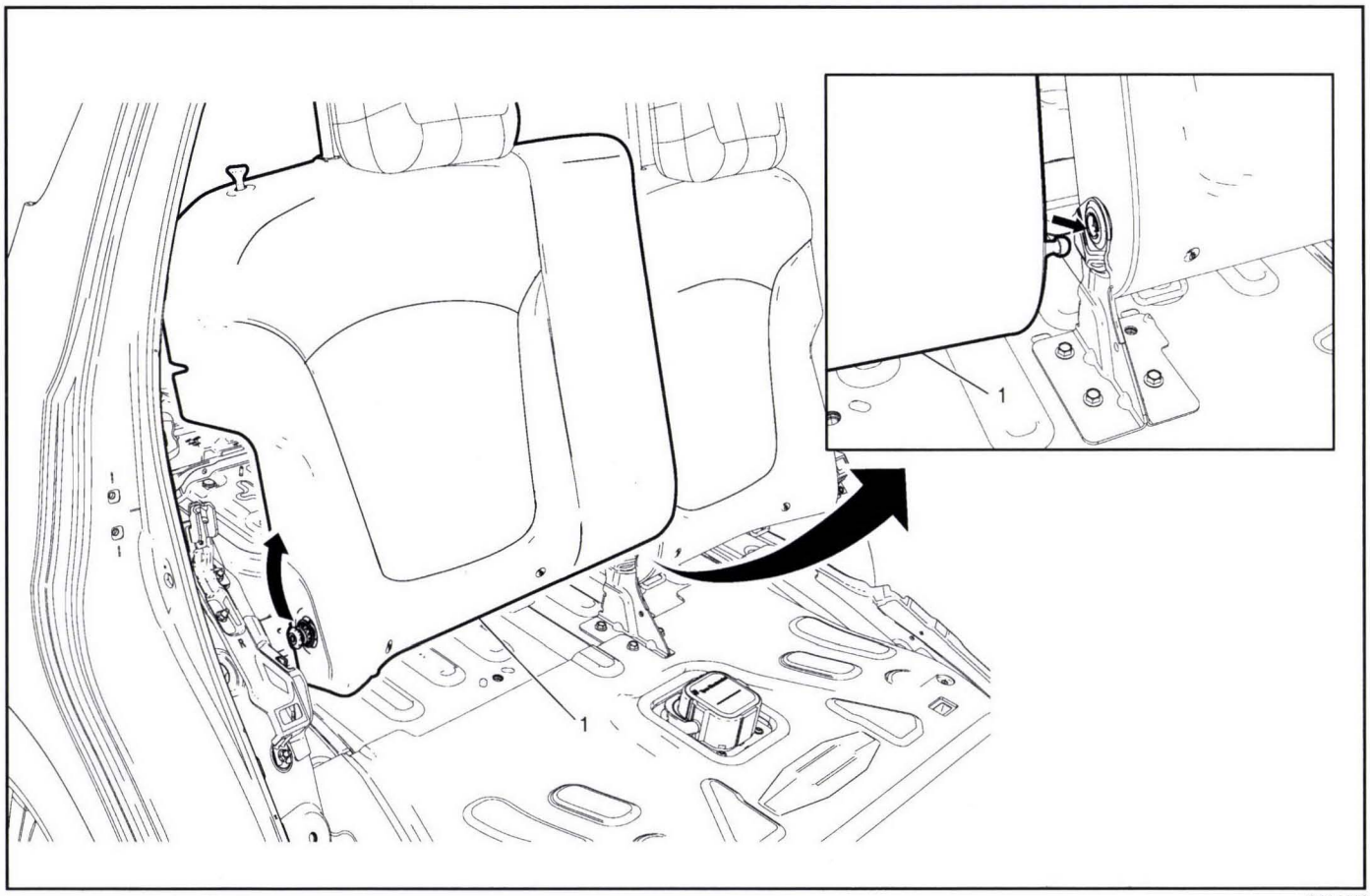


2309384

Rear Seat Back Cushion Latch Replacement

Callout	Component Name
Preliminary Procedure Remove rear seat back cover. Refer to *Rear Seat Back Cover Replacement on page 13-26*.	
1	Rear Seat Back Cushion Latch Bolt (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 11 N•m (97 lb in)
2	Rear Seat Back Cushion Latch

Rear Seat Back Cushion Removal and Installation (60 percent seat)

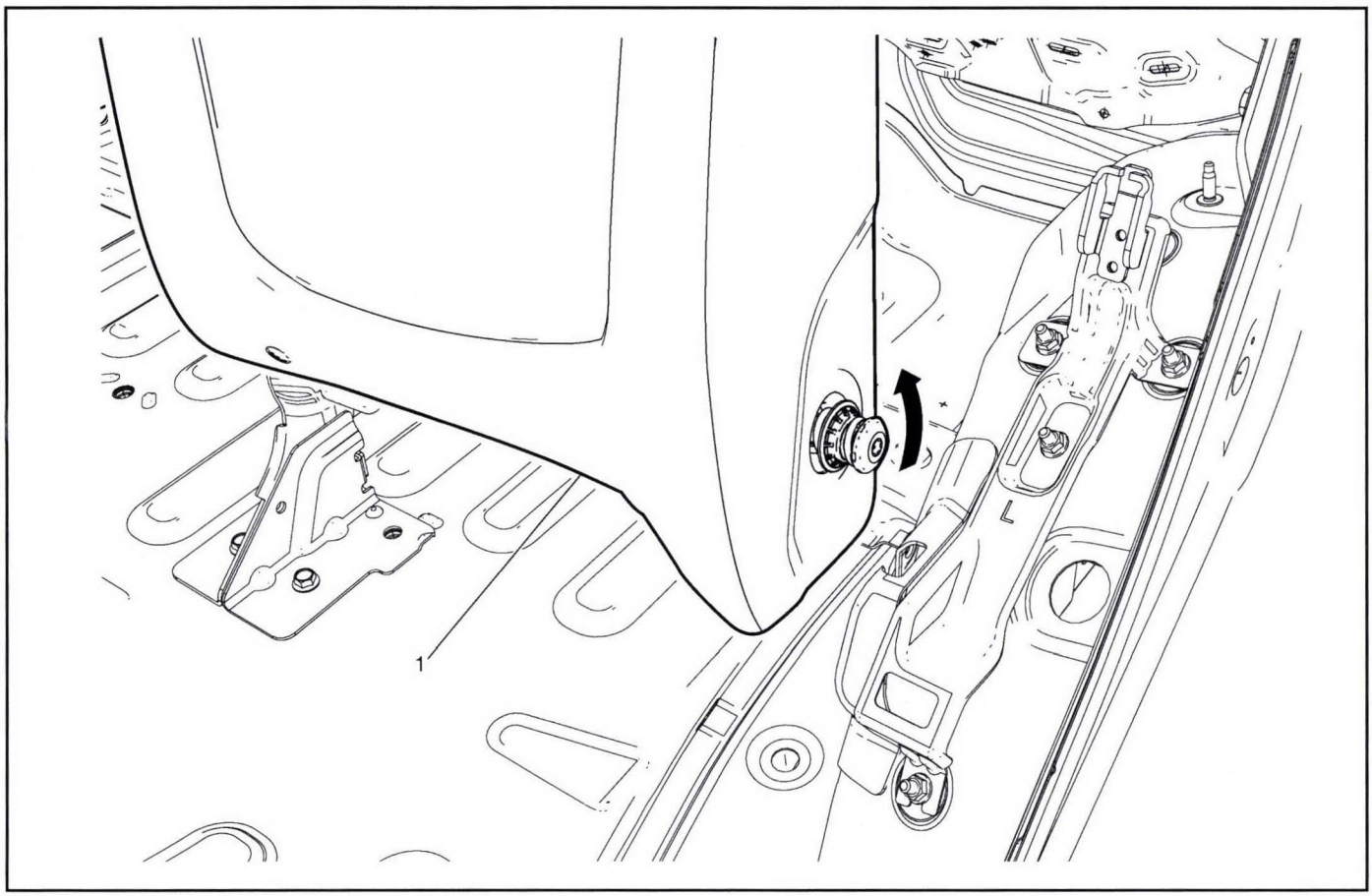


3414110

Rear Seat Back Cushion Removal and Installation (60 percent seat)

Callout	Component Name
Preliminary Procedure 1. Remove the rear seat cushion. Refer to *Rear Seat Cushion Removal and Installation on page 13-21*. 2. Remove the rear seat back bolster. Refer to *Rear Seat Back Bolster Replacement on page 13-19*.	
1	Rear Seat Back Cushion (60 percent seat) **Procedure** 1. Lift up on the right of the seat back cushion to disengage the back cushion from the retainer. 2. Pull the seat back cushion from the center hinge bracket to remove.

Rear Seat Back Cushion Removal and Installation (40 percent seat)

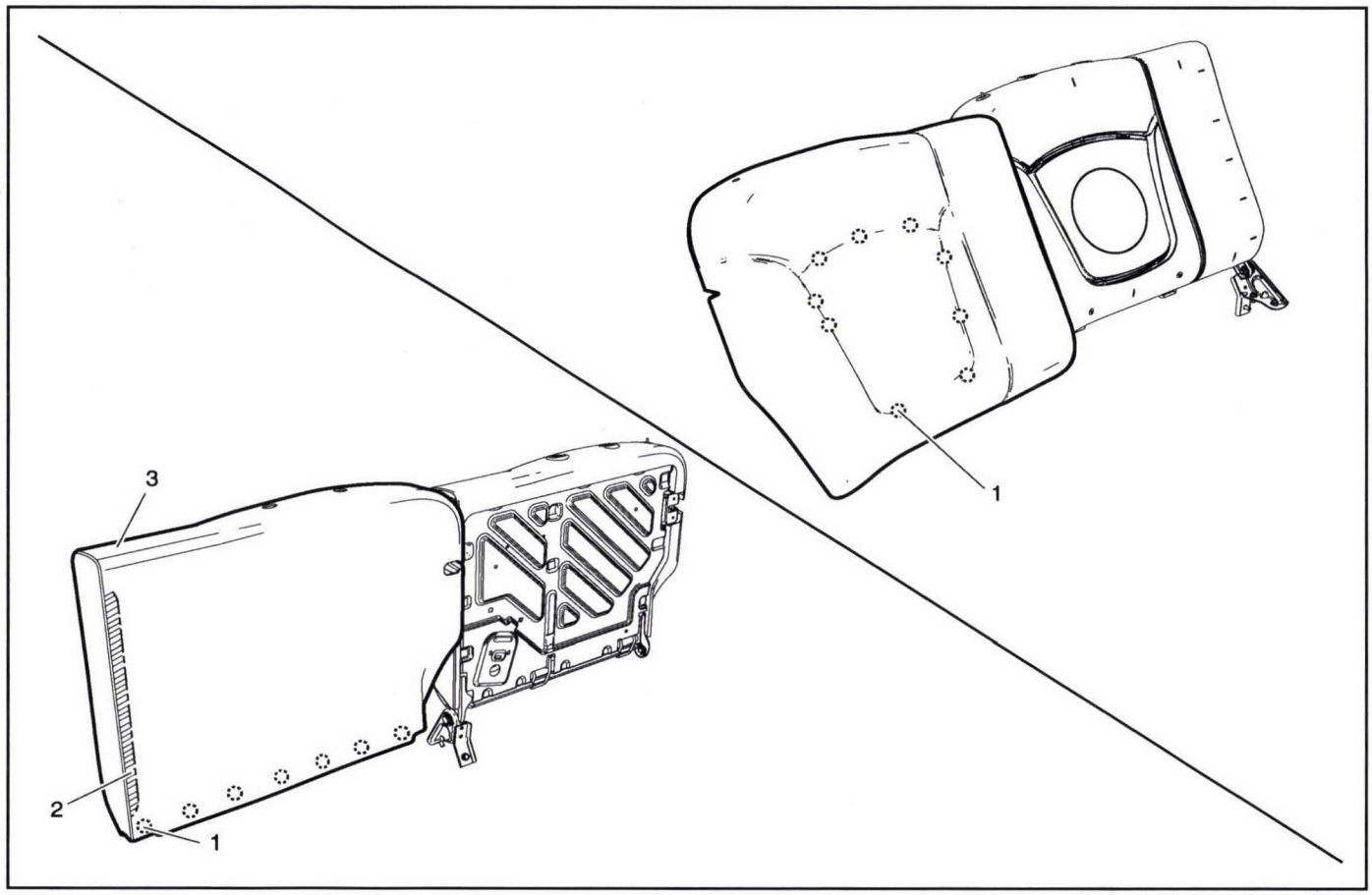


3414106

Rear Seat Back Cushion Removal and Installation (40 percent seat)

Callout	Component Name
Preliminary Procedure 1. Remove the rear seat cushion. Refer to *Rear Seat Cushion Removal and Installation on page 13-21*. 2. Remove the rear seat back bolster. Refer to *Rear Seat Back Bolster Replacement on page 13-19*. 3. Remove the rear seat back cushion (60 percent seat). Refer to *Rear Seat Back Cushion Removal and Installation (60 percent seat) on page 13-24* or *Rear Seat Back Cushion Removal and Installation (40 percent seat) on page 13-25*.	
1	Rear Seat Back Cushion (40 percent seat) **Procedure** 1. Lift up on the right of the seat back cushion to disengage the back cushion from the retainer. 2. Pull the seat back cushion from the center hinge bracket to remove.

Rear Seat Back Cover Replacement



2309379

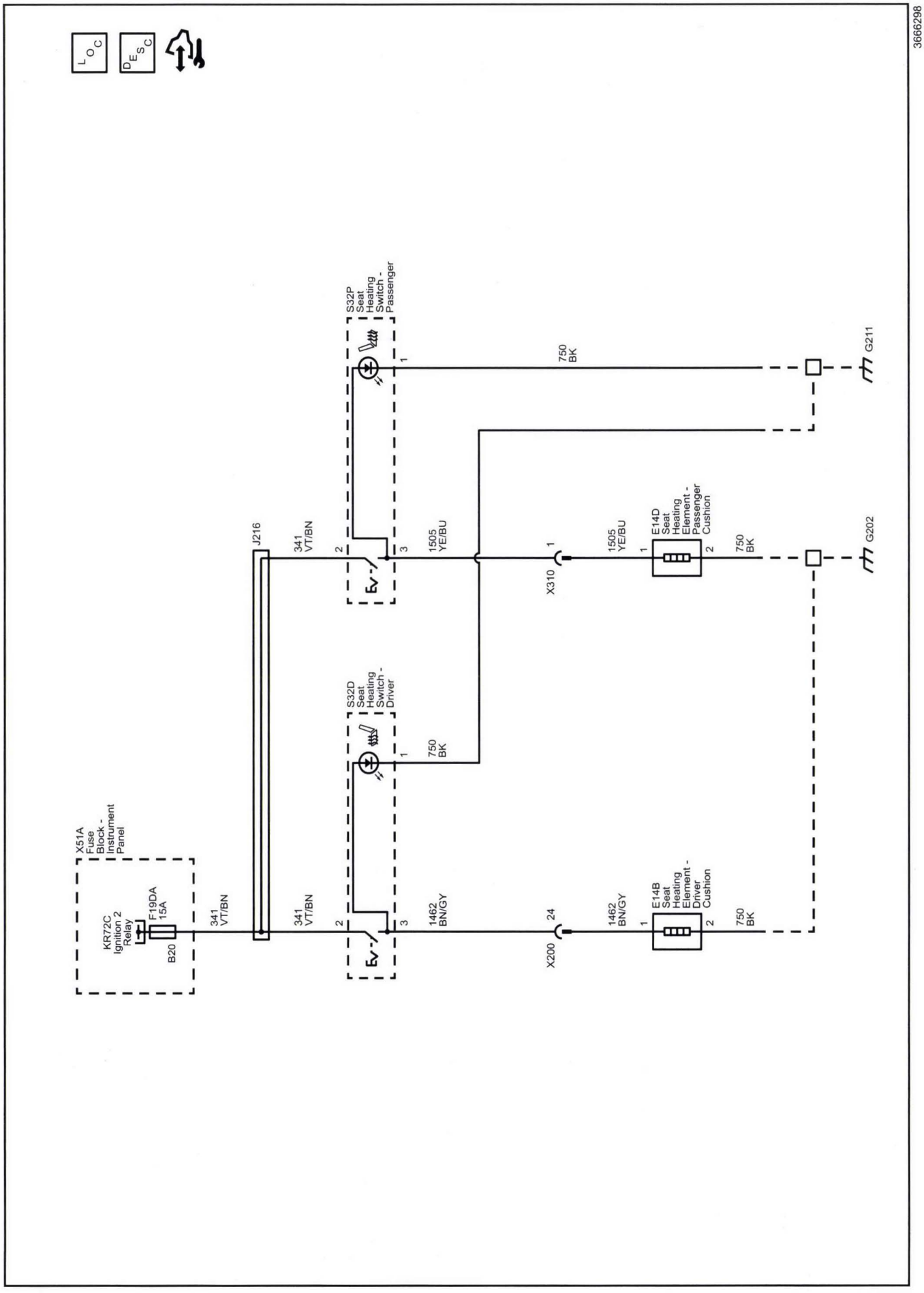
Rear Seat Back Cover Replacement

Callout	Component Name
Preliminary Procedure Remove the rear seat back cushion. Refer to *Rear Seat Cushion Removal and Installation on page 13-21*.	
1	Rear Seat Back Cushion Cover Hog Ring (Qty: 16) **Tip:** Begin at the rear part of the rear seat, release the hog rings.
2	Rear Seat Back Cushion Cover Zipper **Tip:** Open the zipper to remove the cushion cover.
3	Rear Seat Back Cushion Cover

Seat Heating and Cooling

Schematic and Routing Diagrams

Heated/Cooled Seat Schematics (Heated Seats)



Diagnostic Information and Procedures

Symptoms - Seat Heating and Cooling

Important: Review the system description in order to familiarize yourself with the system functions. Refer to *Heated Seats Description and Operation on page 13-34*

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the heated seat system. Refer to *Checking Aftermarket Accessories on page 11-871*
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.

Symptom List

Refer to *Front Heated Seat Malfunction on page 13-29* in order to diagnose the symptom.

Front Heated Seat Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition Voltage	1	1	—	—
Heated Seat Element Supply Voltage	1	1	3	—
Heated Seat Element Ground	—	1	—	—
Heated Seat Switch Ground	—	2	—	—

1. Heated seat is inoperative
2. Heated seat indicator is inoperative
3. Heated seat is always ON

Circuit/System Description

With the Vehicle ON, ignition voltage is applied to the driver and passenger heated seat switches through 15 A fuse located in the instrument panel fuse block. Ground for the seat heater element is supplied from the heater element ground circuit and ground connection G202. Ground is supplied to both the driver and passenger the heated seat switches through the switch ground circuit and the ground connection G211. This ground circuit is used only for the purpose of illuminating heated seat ON indicator. When a heated seat switch is pressed, ignition voltage is applied through the switch contacts and the control circuit activating the seat cushion heater element.

Reference Information

Schematic Reference

Heated/Cooled Seat Schematics on page 13-28

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Heated Seats Description and Operation on page 13-34

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*

- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify the heated seat turns ON and OFF when cycling the heated seat switch ON and OFF.

⇒ **If the heated seat does not turn ON or OFF**

Refer to Circuit/System Testing – Heated Seat Circuit Test

⇓ **If the heated seat turns ON and OFF**

3. Verify the heated seat switch indicator turns ON and OFF when cycling the heated seat switch ON and OFF.

⇒ **If the indicator does not turn ON or OFF**

Refer to Circuit/System Testing – Heated Seat Switch Indicator Circuit Test

Circuit/System Testing

Heated Seat Circuit Test

1. Vehicle OFF, disconnect the harness connector at the appropriate S32 Seat Heating Switch, Vehicle in Service Mode.
2. Verify a test lamp illuminates between the ignition circuit terminal 2 and ground.

⇒ **If the test lamp does not illuminate and the circuit fuse is good**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ignition circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, refer to *Power Mode Mismatch on page 11-857*.

⇒ **If the test lamp does not illuminate and the circuit fuse is open**

2.1. Vehicle OFF.

2.2. Test for infinite resistance between the ignition circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

Note: The fuse feeds both the driver and passenger seat heating elements. Test both the driver and passenger seat heating element control circuits.

2.3. Test for greater than 10 Ω between the control circuit terminal 3 and ground

⇒ If 10 Ω or less, disconnect the E14 Seat Heating Element – Cushion and verify the short is in the circuit or the component.

⇒ If greater than 10 Ω, replace the S32 Seat Heating Switch.

⇓ **If the test lamp illuminates**

3. Vehicle OFF, connect the harness connector at the S32 Seat Heating Switch and disconnect the harness connector at the E14 Seat Heating Element – Cushion.
4. Test for less than 10 Ω between the ground circuit terminal 2 and ground.

⇒ **If 10 Ω or greater**

4.1. Vehicle OFF.

4.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less then 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

5. Install a test lamp between the control circuit terminal 1 and ground, Vehicle in Service Mode.
6. Verify the test lamp turns ON and OFF when commanding heated seat ON and OFF using the S32 Seat Heating Switch.

⇒ **If the test lamp remains OFF**

6.1. Vehicle OFF, disconnect the harness connector at the S32 Seat Heating Switch.

6.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

6.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, test or replace the S32 Seat Heating Switch.

⇒ **If the test lamp remains ON**

6.1. Vehicle OFF, disconnect the harness connector at the S32 Seat Heating Switch, Vehicle in Service Mode.

6.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, test or replace the S32 Seat Heating Switch.

⇓ **If the test lamp turns ON and OFF**

7. Test or replace the E14 Seat Heating Element – Cushion.

Heated Seat Switch Indicator Circuit Test

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the appropriate S32 Seat Heating Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 1 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less then 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Test or replace the S32 Seat Heating Switch.

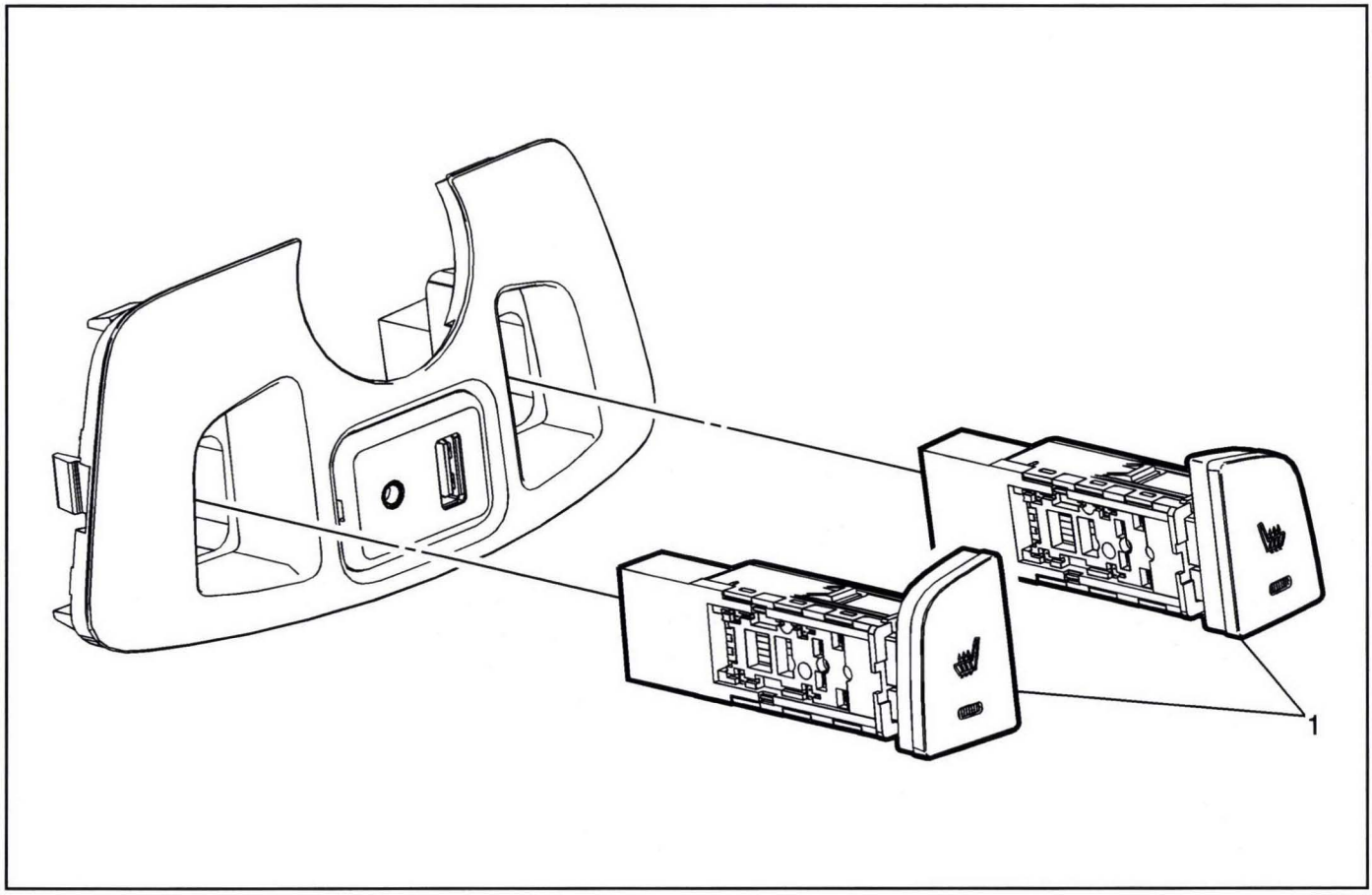
Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Driver or Passenger Seat Back Heater Replacement on page 13-32*
- *Front Seat Cushion Heater Replacement on page 13-33*

Repair Instructions

Front Seat Heater Switch Replacement



3021451

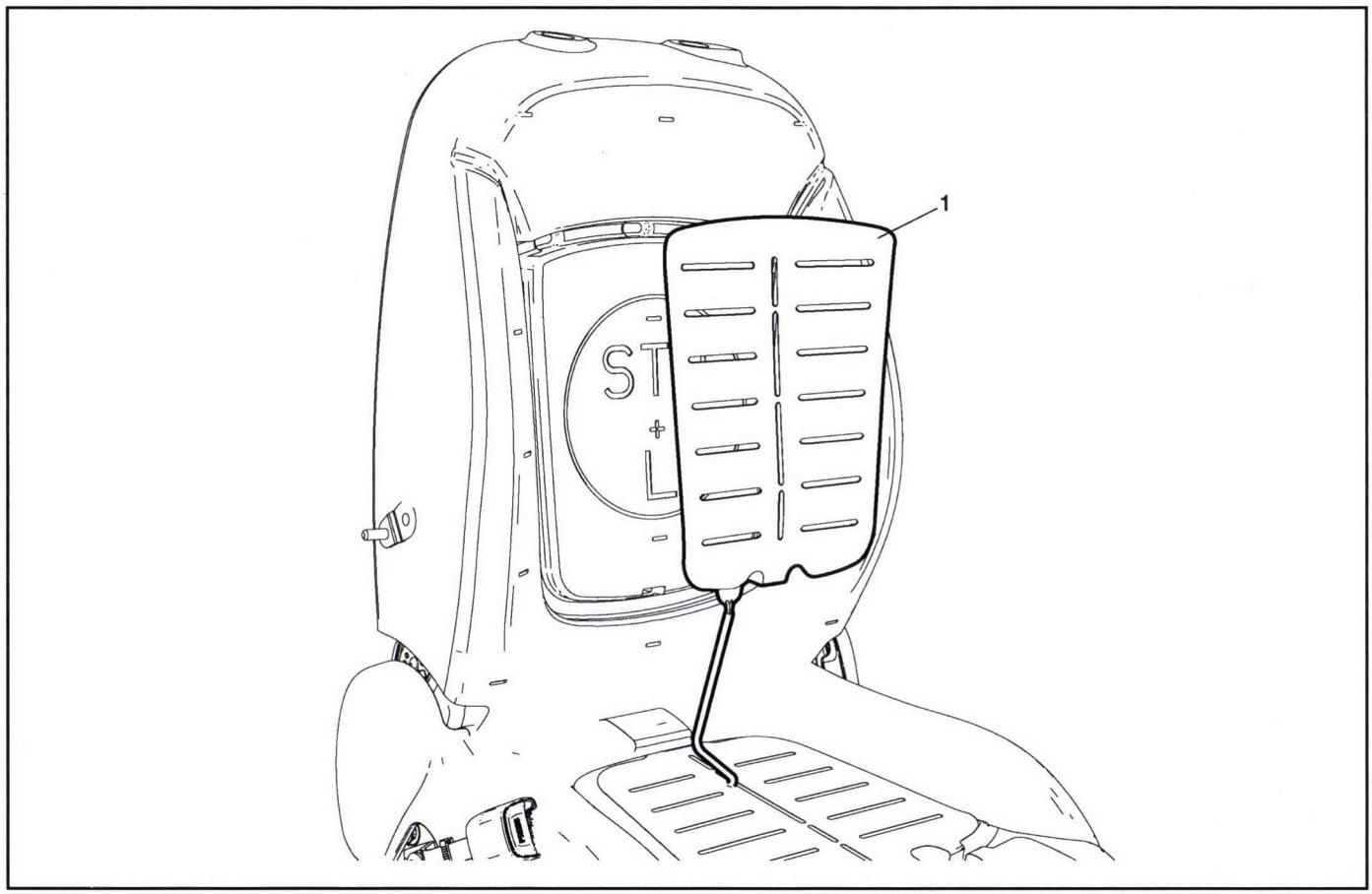
Front Seat Heater Switch Replacement

Callout	Component Name
Preliminary Procedure	
Remove the front seat heater switch bezel. Refer to *Front Seat Heater Switch Bezel Replacement on page 2-42*.	

Front Seat Heater Switch Replacement (cont'd)

Callout	Component Name
1	Front Seat Heater Switch **Procedures** 1. Use a flat-bladed tool to release the switch from the mount plate. 2. Disconnect the electrical connector from the switch assembly.

Driver or Passenger Seat Back Heater Replacement

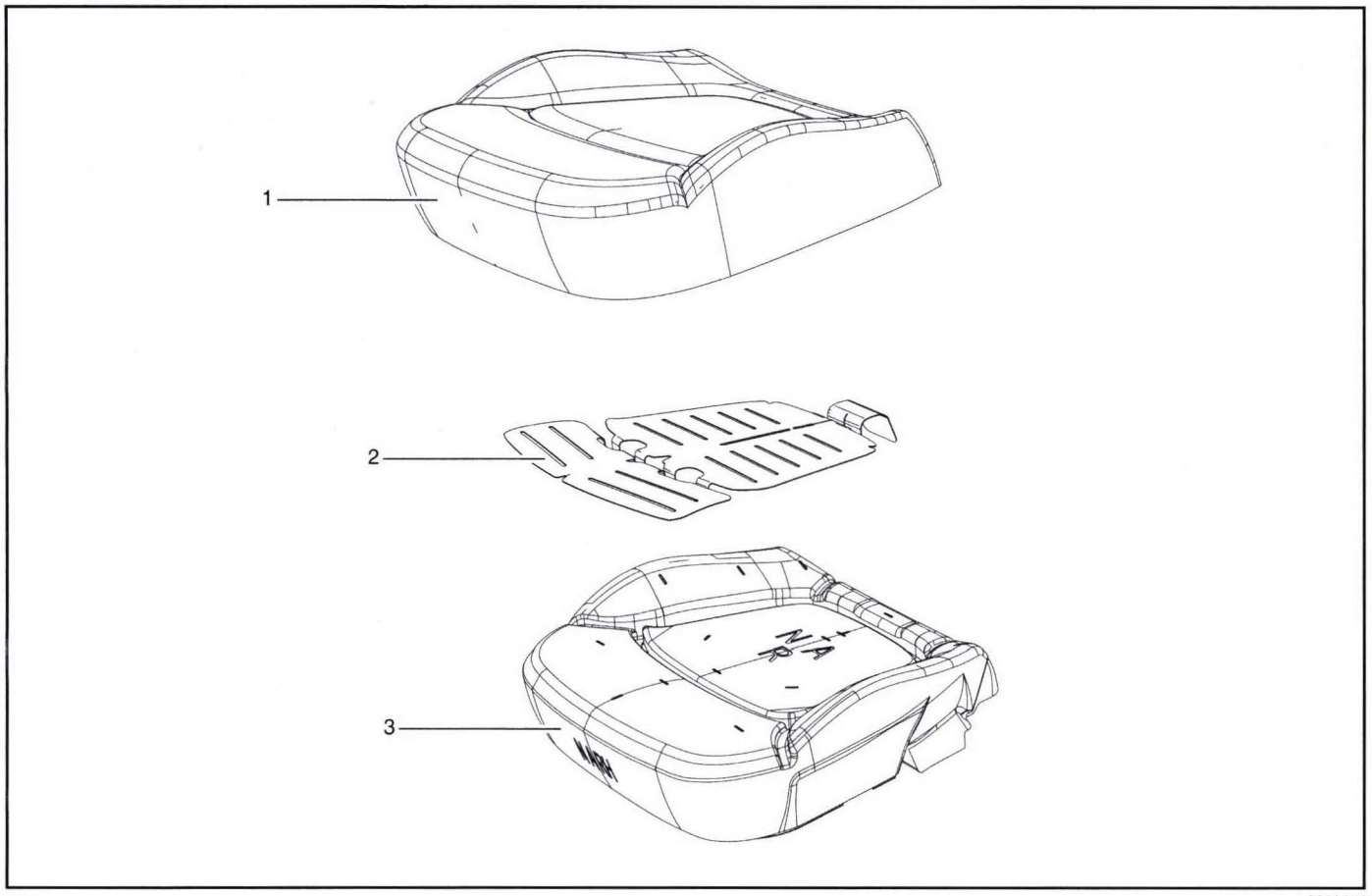


2309337

Driver or Passenger Seat Back Heater Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the driver or passenger seat back cushion cover and pad. Refer to *Driver or Passenger Seat Back Cover and Pad Replacement on page 13-14*. 2. Disconnect the electric harness connector.	
1	Front Seat Back Cushion Heating Mat

Front Seat Cushion Heater Replacement



2833019

Front Seat Cushion Heater Replacement

Callout	Component Name
Warning: Refer to SIR Warning on page 0-7. **Preliminary Procedures** 1. Remove the driver or passenger seat. Refer to *Driver or Passenger Seat Removal and Installation on page 13-3*. 2. Remove the front seat cushion cover and pad. Refer to *Front Seat Cushion Cover and Pad Replacement on page 13-12*.	
1	Front Seat Cushion Cover **Procedure** Separate the seat cushion from the seat cushion pad by pulling the cover away from the pad.
2	Front Seat Cushion Heater ***Warning: Replace the passenger presence system as a complete assembly to prevent possible injury to the occupant. All the components in the service kit are assembled and calibrated as a unit. Using only some of the components in the service kit will cause the passenger presence system to operate improperly.***
3	Front Seat Cushion Pad **Note:** The seat belt presence sensor and heat mat, if equipped, are integral parts of the seat cushion pad.

Description and Operation

Heated Seats Description and Operation

The heated seat system consists of the following components:

- Heated seat switch
- Seat cushion heating element

Heated Seat Operation

With the Vehicle ON, ignition voltage is applied to the driver and passenger heated seat switches through 15 A fuse located in the instrument panel fuse block. Ground for the seat heater element is supplied from the heater element ground circuit and ground connection G302. Ground is supplied to both the driver and passenger the heated seat switches through the switch ground circuit and the ground connection at G202. This ground circuit is used only for the purpose of illuminating heated seat ON indicator. When a heated seat switch is pressed, ignition voltage is applied through the switch contacts and the control circuit activating the seat cushion heater element.

Section 14

Steering

Power Steering 14-3
Specifications 14-3
Fastener Tightening Specifications 14-3
Schematic and Routing Diagrams 14-3
Power Steering Schematics 14-4
Diagnostic Information and Procedures 14-5
DTC C0176 14-5
DTC C0460 14-7
DTC C0475 14-8
DTC C0545 14-9
Symptoms - Power Steering System 14-9
Rattle, Clunk, Pop or Shudder Noise from the Power Steering System 14-10
Whine or Growl Noise from the Power Steering System 14-10
Increase in Effort While Turning Steering Wheel 14-11
Poor Return of Steering Wheel 14-11
Steering Wheel Surges/Jerks While Turning 14-12
Steering Effort Hard or Too Easy in One or Both Directions 14-13
Repair Instructions 14-14
Steering Linkage Outer Tie Rod Replacement 14-14
Steering Gear Boot Replacement 14-15
Electronic Power Steering Motor Control Module Replacement 14-17
Steering Gear Replacement 14-18
Steering Linkage Inner Tie Rod Replacement 14-21
Description and Operation 14-22
Power Steering System Description and Operation (Electric Power Steering) 14-22
Special Tools and Equipment 14-23

Steering Wheel and Column 14-24
Specifications 14-24
Fastener Tightening Specifications 14-24
Diagnostic Information and Procedures 14-24
Symptoms - Steering Wheel and Column 14-24
High Effort While Tilting Column 14-24
Noise in Steering Column 14-24
Looseness in Steering Column 14-25
Repair Instructions 14-26
Intermediate Steering Shaft Boot Replacement 14-26
Intermediate Steering Shaft Inner Boot Replacement 14-27
Intermediate Steering Shaft Replacement 14-28
Steering Column Upper Trim Cover Replacement 14-29
Steering Column Lower Trim Cover Replacement 14-30
Turn Signal Switch Replacement 14-31
Steering Wheel Replacement 14-32
Steering Wheel Spoke Lower Cover Replacement 14-33
Steering Column Replacement 14-34
Description and Operation 14-35
Steering Wheel and Column Description and Operation 14-35
Special Tools and Equipment 14-36

BLANK

Power Steering

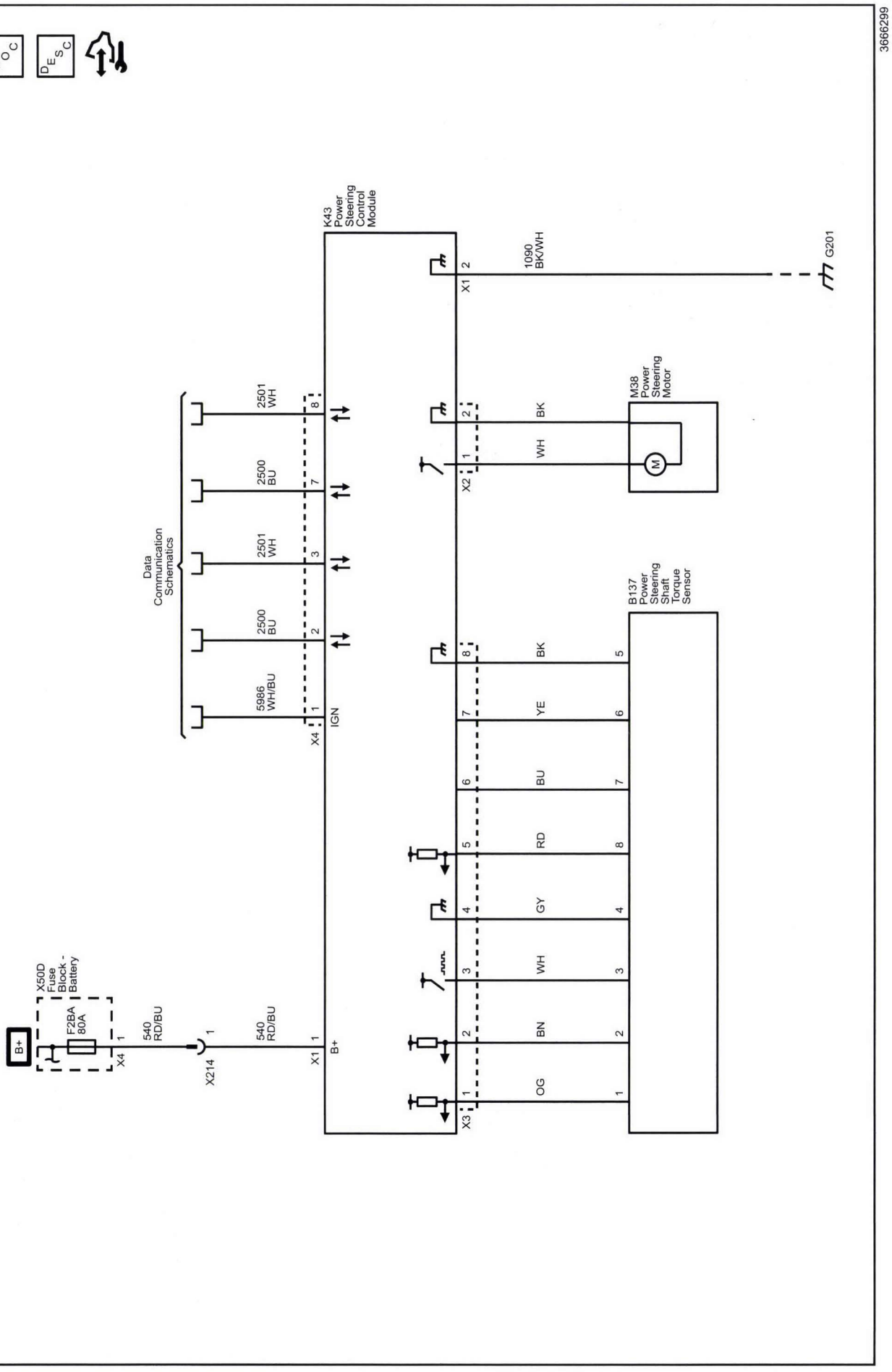
Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Electronic Power Steering Motor Control Module Bracket Bolt	18 N•m	13 lb ft
Electronic Power Steering Motor Control Module to Bracket Bolt	3 N•m	27 lb in
Steering Linkage Inner Tie Rod	88 N•m	65 lb ft
Steering Linkage Inner Tie Rod Nut	75 N•m	55 lb ft
Steering Linkage Outer Tie Rod Nut	50 N•m	37 lb ft
Steering Gear Bolt	110 N•m	81 lb ft

Schematic and Routing Diagrams

Power Steering Schematics (Electric Power Steering)



Diagnostic Information and Procedures

DTC C0176

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC C0176 54: Control Module Temperature Sensor High Temperature

Circuit/System Description

The power steering control module monitors the temperature of the power steering system. The power steering control module uses voltage, current levels and input from an internal temperature sensor to calculate an estimated system temperature. If the power steering control module detects a high system temperature event is occurring, the amount of assist is decreased to reduce system temperature, in effort to prevent thermal damage to the power steering components.

Conditions for Running the DTC

- Vehicle in Service Mode.
- Power steering system voltage is 9–16 V.
- Repetitive steering input applied.

Conditions for Setting the DTC

The power steering control module detects a high system temperature.

Action Taken When the DTC Sets

- DTC C0176 54 is stored in memory.
- Steering assist is reduced.

Conditions for Clearing the DTC

A current DTC will clear on the next malfunction-free ignition cycle.

Diagnostic Aids

- DTC C0176 54 does not indicate that a malfunction has occurred. Rather that the power steering control module had to limit current to the power steering motor to avoid thermal damage to the power steering system components. Discuss with the customer about driving conditions when the steering assist was reduced.
- Ensure that no steering components down stream of the power steering column assembly, such as ball joints, tie rod ends, universal joints, or the steering gear assembly, are mechanically binding.

Reference Information

Schematic Reference

Power Steering Schematics on page 14-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Steering System Description and Operation (Electric Power Steering) on page 14-22

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information.

Circuit/System Verification

1. Verify that the DTC sets outside of the conditions for running and setting. Since most occurrences of this DTC are caused by excessive driver inputs, review with the customer the conditions under which the DTC set.

⇒ **If the DTC did not set outside of the conditions for running and setting**

1.1. Vehicle in Service Mode.

1.2. Operate the vehicle within the conditions that the customer experienced, avoiding excessive inputs, and verify the DTC does not reset.

⇒ If the DTC is set

1.2.1. Verify that no steering components down stream of the power steering column assembly are mechanically binding. Refer to *Steering Effort Hard or Too Easy in One or Both Directions on page 14-13*

⇒ If steering components are mechanically binding, replace the mechanically binding steering components.

⇒ If no steering components are mechanically binding, replace the steering column assembly.

⇓ If the DTC is not set

1.3. All OK.

⇓ **If the DTC set outside of the conditions for running and setting**

2. All OK. The power steering is operating as designed.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Steering Column Replacement on page 14-34*
- *Control Module References on page 6-3* for power steering control module replacement, programming and setup.

DTC C0460

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC C0460 00: Steering Wheel Angle Sensor Malfunction

DTC C0460 4B: Steering Wheel Angle Sensor Calibration Not Learned

Circuit/System Description

The power steering control module contains the steering wheel angle sensor. The steering wheel angle sensor identifies the position and direction of the steering wheel rotation. The steering wheel angle signal is sending a serial data to the GMLAN high speed bus.

Conditions for Running the DTC

- Vehicle in Service Mode.
- Power steering system voltage is 9–16 V.

Conditions for Setting the DTC

DTC C0460 00

- Steering angle signal is not valid.
- Steering angle signal line is open.
- Steering angle signal cycle time is out of range.
- Steering angle signal duty cycle is out of range.

DTC C0460 4B

Steering sensor zero position is not set.

Action Taken When the DTC Sets

- DTC C0460 is stored in memory.
- No steering assist.

Conditions for Clearing the DTC

A current DTC will clear on the next malfunction-free ignition cycle.

Reference Information

Schematic Reference

Power Steering Schematics on page 14-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Steering System Description and Operation (Electric Power Steering) on page 14-22

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify the DTC is not set.

⇒ **If the DTC is set**

2.1. Calibrate the K43 Power Steering Control Module. Refer to *Power Steering Control Module Programming and Setup on page 6-15*

2.2. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC

⇒ If the DTC sets, replace the steering column assembly.

⇓ If the DTC is not set

2.3. All OK.

⇓ **If the DTC is not set**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Steering Column Replacement on page 14-34*
- *Control Module References on page 6-3* for power steering control module replacement, programming and setup.

DTC C0475

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC C0475 00: Electric Steering Motor Circuit Malfunction

Circuit/System Description

The power steering control module continuously monitors the voltage and current levels being commanded to the 3-phase steering motor. The power steering control module compares the desired and actual current levels to detect malfunctions in the internal power steering motor circuits.

Conditions for Running the DTC

Vehicle in Service Mode.

Conditions for Setting the DTC

The power steering control module detects a short to ground, short to voltage, or an open/high resistance on any of the internal power steering motor circuits.

Action Taken When the DTC Sets

- The DTC is stored in memory.
- No steering assist.

Conditions for Clearing the DTC

A history DTC will clear after 40 consecutive malfunction-free ignition cycles.

Reference Information

Schematic Reference

Power Steering Schematics on page 14-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Steering System Description and Operation (Electric Power Steering) on page 14-22

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information.

Circuit/System Testing

1. Vehicle in Service Mode.
2. Verify that DTC C0475 is not set.

⇒ **If the DTC is set**

Replace the steering column assembly.

⇓ **If the DTC is not set**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Steering Column Replacement on page 14-34*
- *Control Module References on page 6-3* for power steering control module replacement, programming and setup.

DTC C0545

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC C0545 00: Steering Wheel Torque Sensor Malfunction

Circuit/System Description

The power steering control module continuously monitors the digital torque sensor signal. As the steering wheel is turned and torsional twist is applied to the steering shaft, the steering input and output shafts are monitored via the torque signal circuit and then processed by the power steering control module to calculate the steering torque.

Conditions for Running the DTC

Vehicle in Service Mode.

Conditions for Setting the DTC

The power steering control module detects a short to ground, short to voltage, or an open/high resistance on any of the torque sensor circuits.

Action Taken When the DTC Sets

- DTC C0545 is stored in memory.
- No steering assist.

Conditions for Clearing the DTC

A history DTC will clear after 40 consecutive malfunction-free ignition cycles.

Reference Information

Schematic Reference

Power Steering Schematics on page 14-4

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Power Steering System Description and Operation (Electric Power Steering) on page 14-22

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information.

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify the scan tool the steering input torque changes when turning the steering wheel.

⇒ **If the parameter does not change**

Refer to Circuit/System Testing

⇓ **If the parameter changes**

3. All OK.

Circuit/System Testing

1. Vehicle in Service Mode.
2. Verify that DTC C0545 is not set.

⇒ **If the DTC is set**

Replace the steering column assembly.

⇓ **If the DTC is not set**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Steering Column Replacement on page 14-34*
- *Control Module References on page 6-3* for power steering control module replacement, programming and setup.

Symptoms - Power Steering System

Note: Review the system description and operation in order to familiarize yourself with the system functions. Refer to *Power Steering System Description and Operation (Electric Power Steering) on page 14-22.*

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the power steering system.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Symptoms List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- *Rattle, Clunk, Pop or Shudder Noise from the Power Steering System on page 14-10*
- *Whine or Growl Noise from the Power Steering System on page 14-10*

- *Increase in Effort While Turning Steering Wheel on page 14-11*
- *Poor Return of Steering Wheel on page 14-11*
- *Steering Wheel Surges/Jerks While Turning on page 14-12*
- *Steering Effort Hard or Too Easy in One or Both Directions on page 14-13*

Rattle, Clunk, Pop or Shudder Noise from the Power Steering System

Step	Action	Yes	No
1	Did you review the Power Steering System Symptoms and perform the necessary inspections?	Go to Step 2	Go to *Symptoms - Power Steering System on page 14-9*
2	Verify that a rattle, clunk or shudder noise is present. Is a rattle, clunk or shudder noise present?	Go to Step 3	System OK
3	Inspect the power steering gear for the proper installation. Refer to *Steering Gear Replacement on page 14-18*. Is the power steering gear installation incorrect?	Go to Step 6	Go to Step 4
4	Inspect the intermediate shaft. Is the intermediate shaft worn?	Go to Step 8	Go to Step 5
5	Inspect the suspension. Is the suspension worn?	Go to Step 7	Go to *Noise Diagnosis - Front Suspension on page 15-32*
6	Install the power steering gear correctly. Refer to *Steering Gear Replacement on page 14-18*. Did you complete the repair?	Go to Step 9	—
7	Replace the worn suspension components. Did you complete the repair?	Go to Step 9	—
8	Replace the intermediate shaft. Refer to *Intermediate Steering Shaft Replacement on page 14-28*. Did you complete the repair?	Go to Step 9	—
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

Whine or Growl Noise from the Power Steering System

Step	Action	Yes	No
1	Did you review the Power Steering System Symptoms and perform the necessary inspections?	Go to *Step 2*	Go to *Symptoms - Power Steering System on page 14-9*.
2	Verify that a whine or a growl noise is present. Is a whine or a growl noise present?	Go to *Step 3*	System OK
3	Inspect the power steering gear for the proper installation. Refer to *Steering Gear Replacement on page 14-18*. Is the power steering gear installation incorrect?	Go to *Step 6*	Go to *Step 4*
4	Inspect the intermediate shaft. Is the intermediate shaft worn?	Go to *Step 8*	Go to *Step 5*
5	Inspect the suspension. Is the suspension worn?	Go to *Step 7*	Go to *Noise Diagnosis - Front Suspension on page 15-32*.
6	Install the power steering gear correctly. Refer to *Steering Gear Replacement on page 14-18*. Did you complete the repair?	Go to *Step 9*	—
7	Replace the worn suspension components. Did you complete the repair?	Go to *Step 9*	—

Whine or Growl Noise from the Power Steering System (cont'd)

Step	Action	Yes	No
8	Replace the intermediate shaft. Refer to *Intermediate Steering Shaft Replacement on page 14-28.* Did you complete the repair?	Go to *Step 9*	—
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to *Step 3*

Increase in Effort While Turning Steering Wheel

Step	Action	Yes	No
1	Did you review the Power Steering System Description and Operation and perform the necessary inspections?	Go to *Step 2*	Go to *Power Steering System Description and Operation (Electric Power Steering) on page 14-22*
2	Verify that there is an increase in effort while turning is present. Does the system operate normally?	System OK	Go to *Step 3*
3	Check for the following conditions: • Incorrect tire inflation - Refer to *Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label on page 1-12.* • Improper tire size Did you find and correct the condition?	Go to *Step 10*	Go to *Step 4*
4	1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27.* 2. Check for a binding or worn steering linkage outer tie rod. Is the tie rod binding or worn?	Go to *Step 7*	Go to *Step 5*
5	Check for a worn or binding intermediate steering shaft. Is the intermediate steering shaft worn or binding?	Go to *Step 8*	Go to *Step 6*
6	Check for a worn or binding steering gear. Is the steering gear worn or binding?	Go to *Step 9*	System OK
7	Replace the steering linkage outer tie rod. Refer to *Steering Linkage Outer Tie Rod Replacement on page 14-14.* Did you complete the repair?	Go to *Step 10*	—
8	Replace the intermediate steering shaft. Refer to *Intermediate Steering Shaft Replacement on page 14-28.* Did you complete the repair?	Go to *Step 10*	—
9	Replace the steering gear. Refer to *Steering Gear Replacement on page 14-18.* Did you complete the repair?	Go to *Step 10*	—
10	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to *Step 3*

Poor Return of Steering Wheel

Step	Action	Yes	No
DEFINITION: After completing a turn, extra steering input is required for the steering wheel to return to center.			
1	Did you review the General Description and perform the necessary inspections?	Go to *Step 2*	Go to *Power Steering System Description and Operation (Electric Power Steering) on page 14-22*
2	Verify that poor return of the steering wheel is present. Does the system operate normally?	System OK	Go to *Step 3*

Poor Return of Steering Wheel (cont'd)

Step	Action	Yes	No
3	1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Lubricate the tie rod ends and ball joints, if applicable. 3. Inspect the suspension system for worn or damaged components. 4. Repair as necessary. Did you find and correct the condition?	Go to *Step 12*	Go to *Step 4*
4	1. Rotate the steering wheel ONE revolution in both directions. 2. Rotate the steering wheel back to the original position. Was the steering wheel abnormally difficult to rotate in either direction?	Go to *Step 5*	Go to *Step 10*
5	**Note:** Position the wheels straight ahead. Do NOT rotate the steering wheel more than one complete revolution from center. 1. Disconnect the intermediate shaft from the steering column. 2. Note the position of the steering wheel and rotate the steering wheel ONE revolution in both directions. 3. Rotate the steering wheel back to the original position. Was the steering wheel abnormally difficult to rotate in either direction?	Go to *Step 11*	Go to *Step 6*
6	Inspect the intermediate shaft for stiff or loose joints. Repair or replace as necessary. Refer to *Intermediate Steering Shaft Replacement on page 14-28*. Did you find and complete the repair?	Go to *Step 12*	Go to *Step 7*
7	1. Remove the front tire and wheel assemblies. Refer to *Tire and Wheel Removal and Installation on page 15-51*. 2. Disconnect both outer tie rod ends from the steering knuckles. 3. Use your hands in order to move the tie rod end studs. 4. If abnormally difficult to move, replace the tie rod end. Refer to *Steering Linkage Outer Tie Rod Replacement on page 14-14*. Did you find and complete the repair?	Go to *Step 12*	Go to *Step 8*
8	1. Use your hands to rotate the steering knuckle inboard and outboard in order to inspect for a binding strut bearings, ball joints, or axle. 2. Repair or replace any abnormally stiff or loose components. Did you find and complete the repair?	Go to *Step 12*	Go to *Step 9*
9	Inspect for binding in the steering gear. If a binding is present repair or replace the steering gear. Refer to *Steering Gear Replacement on page 14-18*. Did you find and complete the repair?	Go to *Step 12*	Go to *Step 10*
10	Inspect the wheel alignment and adjust as necessary. Refer to *Wheel Alignment Measurement on page 15-63*. Did you find and complete the repair?	Go to *Step 12*	—
11	Inspect the steering column for a binding. If a binding is present, repair or replace the steering column as necessary. Refer to *Steering Column Replacement on page 14-34*. Did you find and complete the repair?	Go to *Step 12*	—
12	Operate the system in order to verify the repair. Did you correct the condition?	System OK	—

Steering Wheel Surges/Jerks While Turning

Step	Action	Yes	No
1	Did you perform the Diagnostic Starting Point – Power Steering System?	Go to *Step 2*	Go to *Symptoms - Power Steering System on page 14-9*

Steering Wheel Surges/Jerks While Turning (cont'd)

Step	Action	Yes	No
2	Verify that the steering wheel surges/jerks while turning. Does the system operate normally?	System OK	Go to *Step 3*
3	Check for worn or binding front suspension components. Did you find and correct the condition?	Go to *Step 14*	Go to *Step 4*
4	1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Check for a binding or worn rack and pinion outer tie rod end. Is the rack and pinion outer tie rod end binding or worn?	Go to *Step 10*	Go to *Step 5*
5	Check for a worn or binding intermediate steering shaft. Is the intermediate steering shaft worn or binding?	Go to *Step 11*	Go to *Step 6*
6	Check for a worn or binding steering gear. Is the steering gear worn or binding?	Go to *Step 12*	Go to *Step 7*
7	Check for a worn or binding steering column. Is the steering column worn or binding?	Go to *Step 13*	Go to *Step 8*
8	Check for excessive heat in the electric power steering (EPS) motor. Does the EPS motor appear to be overheated?	Go to *Step 9*	Go to *Step 13*
9	**Note:** Do not perform excessive parking lot maneuvers during testing, that can cause the EPS motor to heat up. Allow the EPS motor to cool and retest the system. Did you correct the condition?	Go to *Step 14*	Go to *Step 13*
10	Replace the steering linkage outer tie rod end. Refer to *Steering Linkage Outer Tie Rod Replacement on page 14-14*. Did you complete the repair?	Go to *Step 14*	—
11	Replace the intermediate steering shaft. Refer to *Intermediate Steering Shaft Replacement on page 14-28*. Did you complete the repair?	Go to *Step 14*	—
12	Replace the steering gear. Refer to *Steering Gear Replacement on page 14-18*. Did you complete the repair?	Go to *Step 14*	—
13	Replace the steering column. Refer to *Steering Column Replacement on page 14-34*. Did you complete the repair?	Go to *Step 14*	—
14	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to *Step 3*

Steering Effort Hard or Too Easy in One or Both Directions

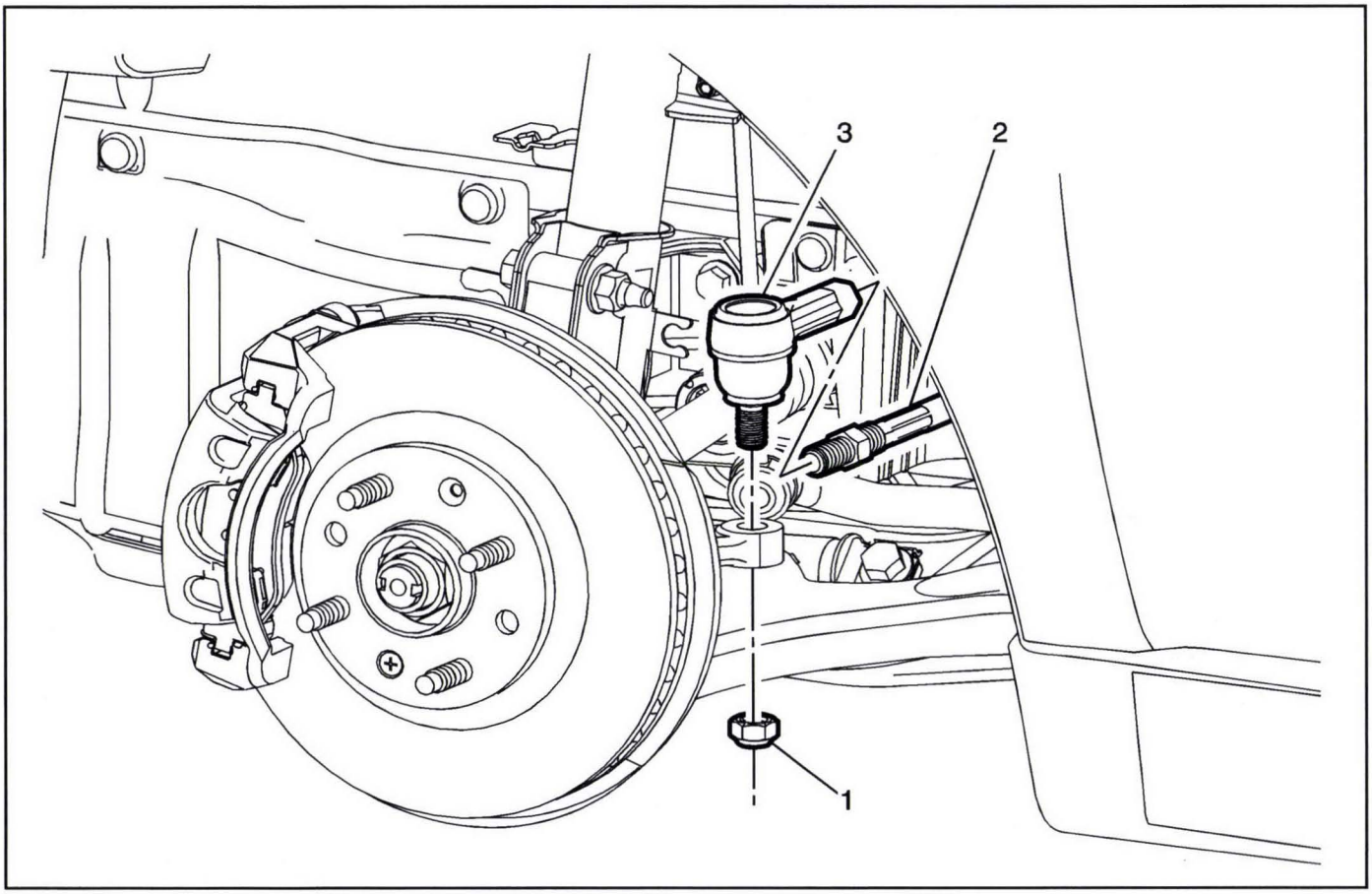
Condition	Action
The battery power is low.	Ensure proper battery voltage.
One or both of the intermediate steering shaft boots are binding.	Adjust or replace the intermediate steering shaft boots and/or intermediate steering shaft. Refer to *Intermediate Steering Shaft Inner Boot Replacement on page 14-27*, *Intermediate Steering Shaft Boot Replacement on page 14-26* and *Intermediate Steering Shaft Replacement on page 14-28*.
The intermediate steering shaft joints and/or fasteners are worn or binding.	Tighten or replace the intermediate steering shaft joints and/or fasteners. Refer to *Intermediate Steering Shaft Replacement on page 14-28*.
The steering gear is binding.	Replace the steering gear. Refer to *Steering Gear Replacement on page 14-18*.
The upper steering shaft is bent.	Replace the steering column. Refer to *Steering Column Replacement on page 14-34*.

Steering Effort Hard or Too Easy in One or Both Directions (cont'd)

Condition	Action
The connectors to the power steering assist motor are damaged or disconnected.	Verify the connectors are properly connected. Verify the connectors are not damaged. If the connectors are damaged, replace the connectors.
The power steering control module is malfunctioning.	Confirm the DTC. Replace the power steering control module. Refer to *Electronic Power Steering Motor Control Module Replacement on page 14-17*.
The power steering assist motor shaft is binding.	Confirm the DTC. Replace the steering column. Refer to *Steering Column Replacement on page 14-34*.

Repair Instructions

Steering Linkage Outer Tie Rod Replacement



3223144

Steering Linkage Outer Tie Rod Replacement

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Remove the front tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation on page 15-51*.	
1	Steering Linkage Outer Tie Rod Nut **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 50 N•m (37 lb ft)

Steering Linkage Outer Tie Rod Replacement (cont'd)

Callout	Component Name
2	Steering Linkage Inner Tie Rod Nut **Procedure** 1. Place match marks on the steering linkage inner tie rod nut and the steering linkage inner tie rod. 2. During installation, align the match marks. 3. Do not tighten the nut during installation. Tighten the nut after adjusting the front toe. **Tighten** 75 N•m (55 lb ft)
3	Steering Linkage Outer Tie Rod **Caution:** Do not free the ball stud by using a pickle fork or a wedge-type tool. Damage to the seal or bushing may result. **Procedure** 1. Use the *DT-50049* tie rod end puller to disconnect the steering linkage outer tie rod from the steering knuckle. 2. Clean the tapered surface of the steering knuckle. 3. Inspect the steering linkage inner tie rod for bent or damaged threads. Repair or replace the tie rod if necessary. Refer to *Steering Linkage Inner Tie Rod Replacement on page 14-21*. 4. Lubricate the steering linkage inner tie rod threads with chassis lubricant. 5. After the installation is complete, measure and adjust the front toe. Refer to *Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment on page 15-64*. **Special Tools** *DT-50049* Tie Rod End Puller For equivalent regional tools, refer to *Special Tools on page 14-23*.

Steering Gear Boot Replacement

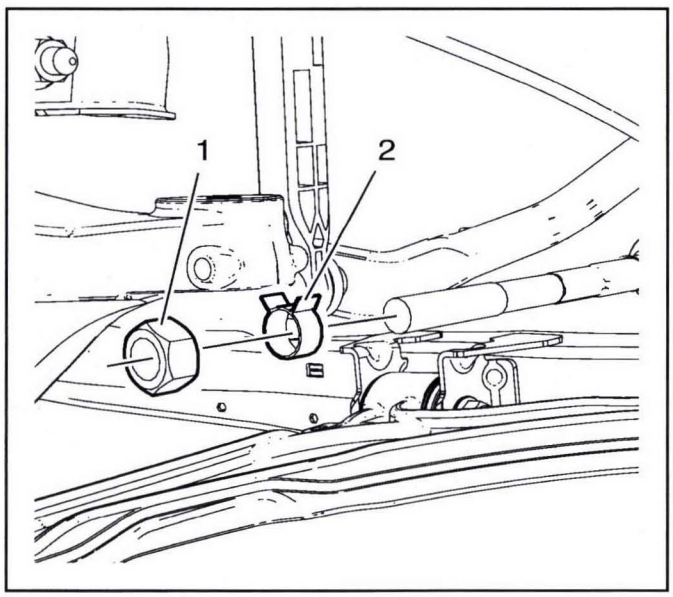
Special Tools

CH-804 Boot Clamp Pliers

For equivalent regional tools, refer to *Special Tools on page 14-23*.

Removal Procedure

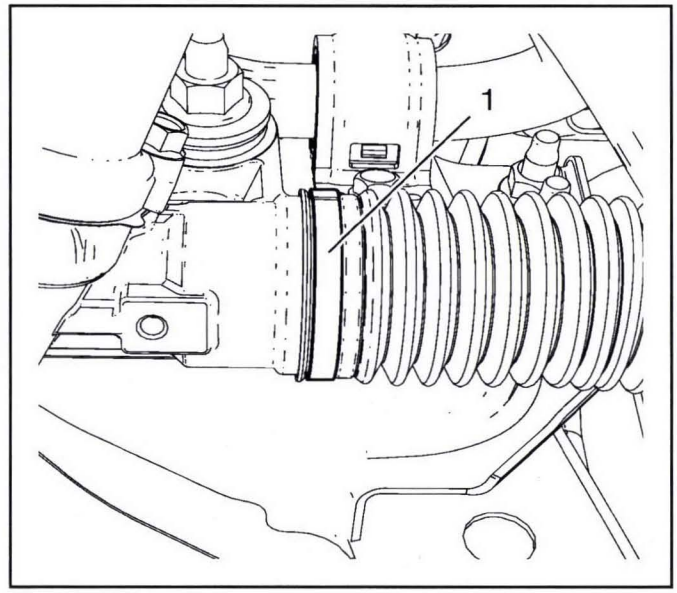
1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*.
2. Remove the steering linkage outer tie rod. Refer to *Steering Linkage Outer Tie Rod Replacement on page 14-14*.



2028056

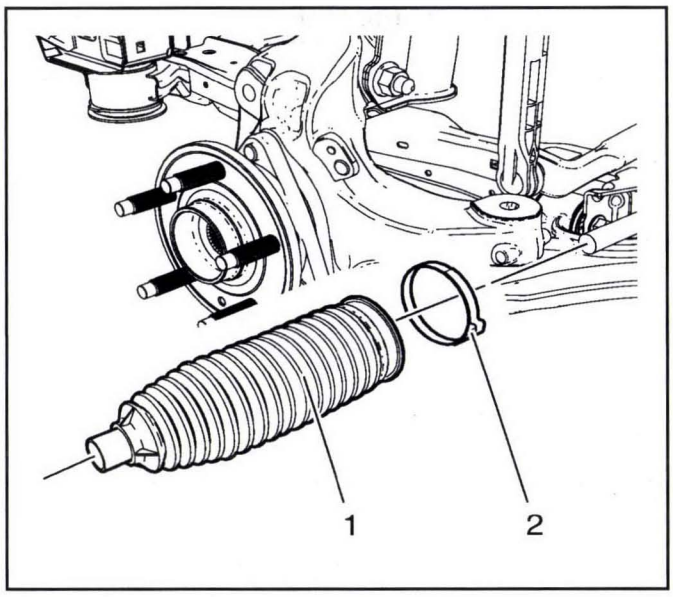
Note: Place match marks on the steering linkage inner tie rod nut and the steering linkage inner tie rod before removing. During installation of the nut, align the match marks.

3. Remove the steering linkage inner tie rod nut (1).
4. Remove the steering gear boot outer clamp (2).



2028057

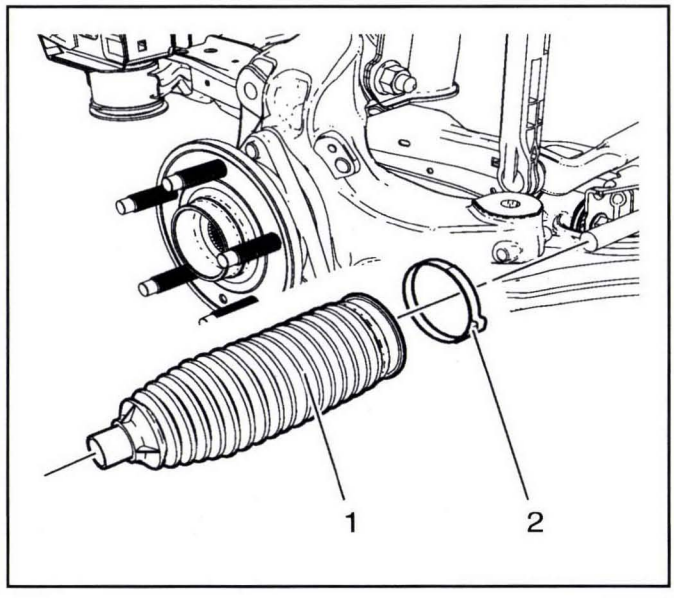
5. Loosen the steering gear boot inner clamp (1).



2028058

6. Remove the steering gear boot (1).
7. Remove the steering gear boot inner clamp (2). Discard the clamp.
8. After removing the steering gear boot, inspect the steering linkage inner tie rod for evidence of corrosion or contamination. If none is evident, continue with the repair. If corrosion or contamination is evident, replace the inner tie rod. Refer to *Steering Linkage Inner Tie Rod Replacement on page 14-21*.

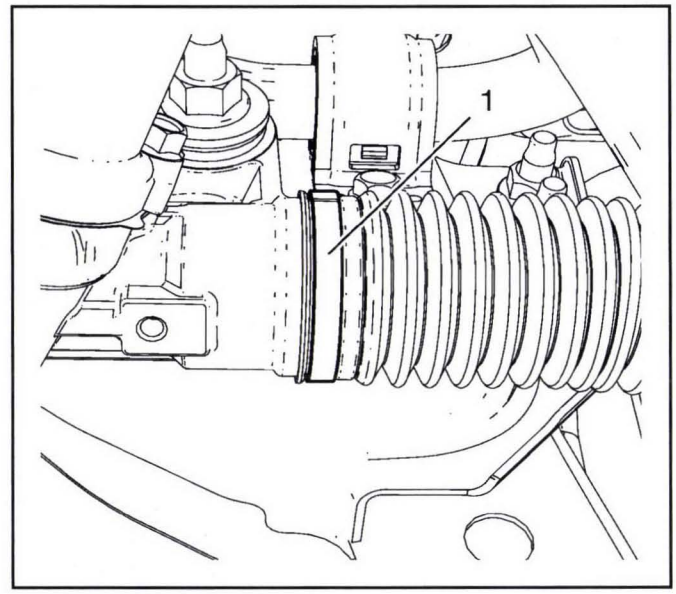
Installation Procedure



2028058

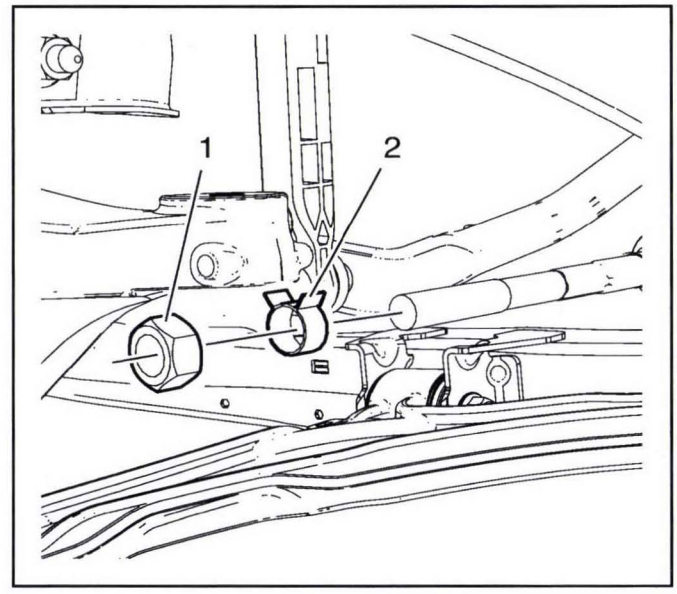
1. Install a new steering gear boot inner clamp (2) loosely on the steering gear boot (1).
2. Apply the lubricant from the service kit to the steering linkage inner tie rod and to the steering gear boot (1).

   Note: The steering gear boot must seat in the appropriate groove on the steering gear.
3. Install the steering gear boot (1) over the steering linkage inner tie rod and onto the steering gear.



2028057

4. Use the *CH-804* pliers to crimp the steering gear boot inner clamp (1).



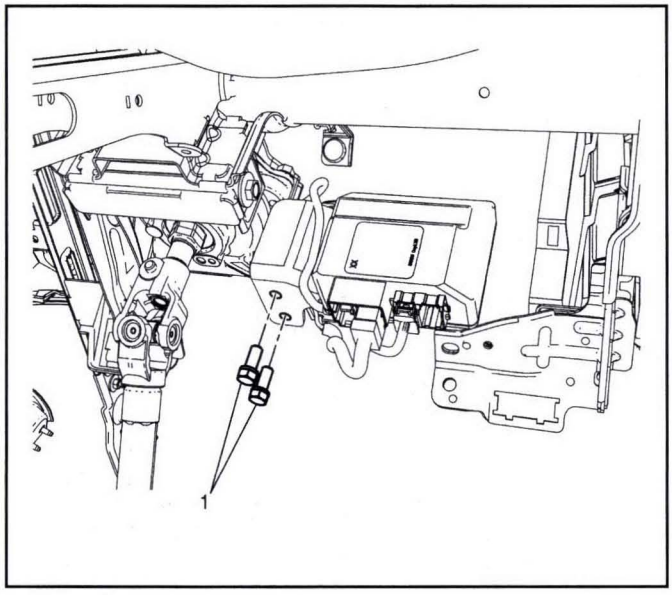
2028056

5. Install the steering gear boot outer clamp (2).
6. Install the steering linkage inner tie rod nut (1).
7. Install the steering linkage outer tie rod. Refer to *Steering Linkage Outer Tie Rod Replacement on page 14-14*.
8. After installation is complete, measure and adjust the front toe. Refer to *Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment on page 15-64*.

Electronic Power Steering Motor Control Module Replacement

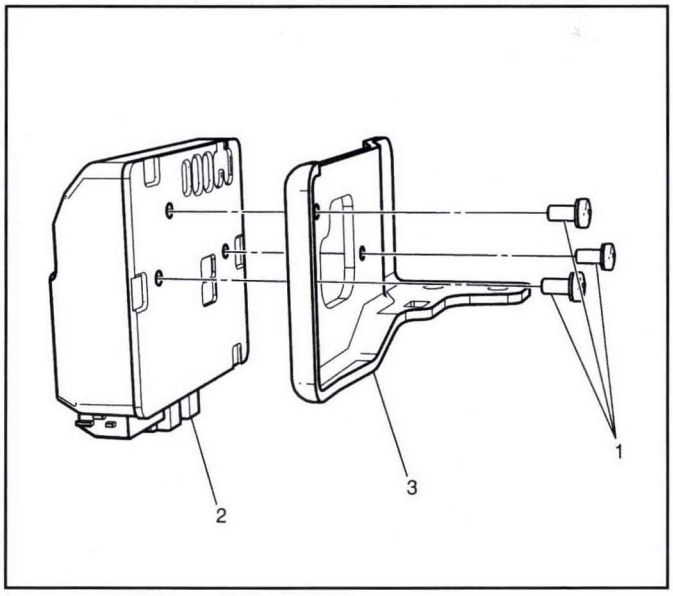
Removal Procedure

1. Remove the steering column lower trim cover. Refer to *Steering Column Lower Trim Cover Replacement on page 14-30*.
2. Remove the instrument panel knee bolster. Refer to *Instrument Panel Knee Bolster Replacement on page 2-22*.
3. Remove the driver side instrument panel lower airbag. Refer to *Instrument Panel Lower Airbag Replacement - Driver Side on page 12-160*.
4. Disconnect any electrical connectors.



2778809

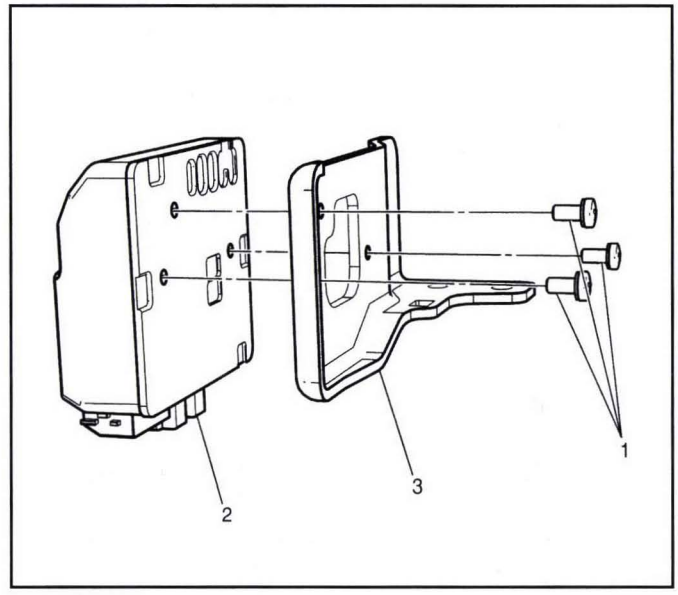
5. Remove the electronic power steering motor control module bracket bolts (1).
6. Remove the electronic power steering motor control module and bracket from the vehicle.



2778814

7. Remove the electronic power steering motor control module to bracket bolts (1).
8. Remove the electronic power steering control module (2) from the electronic power steering control module bracket (3).

Installation Procedure

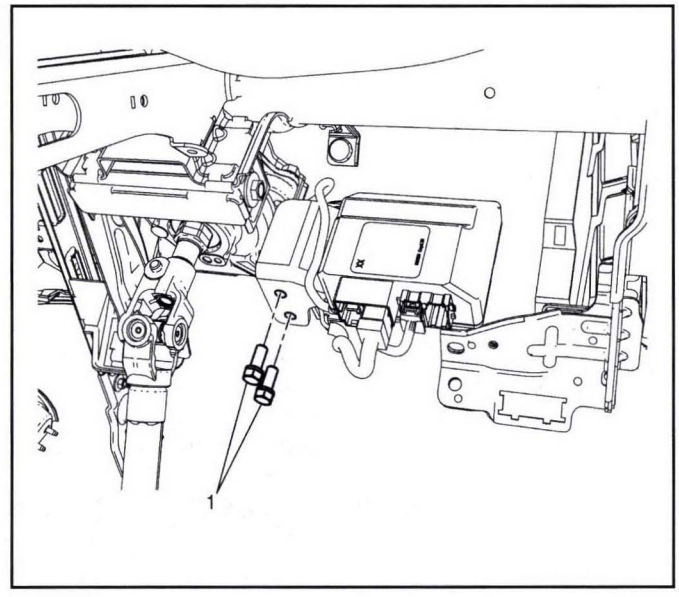


2778814

1. Position the electronic power steering control module (2) on the electronic power steering control module bracket (3).

Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the electronic power steering motor control module to bracket bolts (1) and tighten to **3 N•m (27 lb in)**.



2778809

3. Position the electronic power steering motor control module and bracket in the vehicle.

4. Install the electronic power steering motor control module bracket bolts (1) and tighten to **18 N•m (13 lb ft)**.
5. Connect the electrical connectors.
6. Install the driver side instrument panel lower airbag. Refer to *Instrument Panel Lower Airbag Replacement - Driver Side on page 12-160*.
7. Install the instrument panel knee bolster. Refer to *Instrument Panel Knee Bolster Replacement on page 2-22*.
8. Install the steering column lower trim cover. Refer to *Steering Column Lower Trim Cover Replacement on page 14-30*.
9. If a NEW electronic power steering motor control module is installed, program the module. Refer to *Power Steering Control Module Programming and Setup on page 6-15*.

Steering Gear Replacement

Removal Procedure

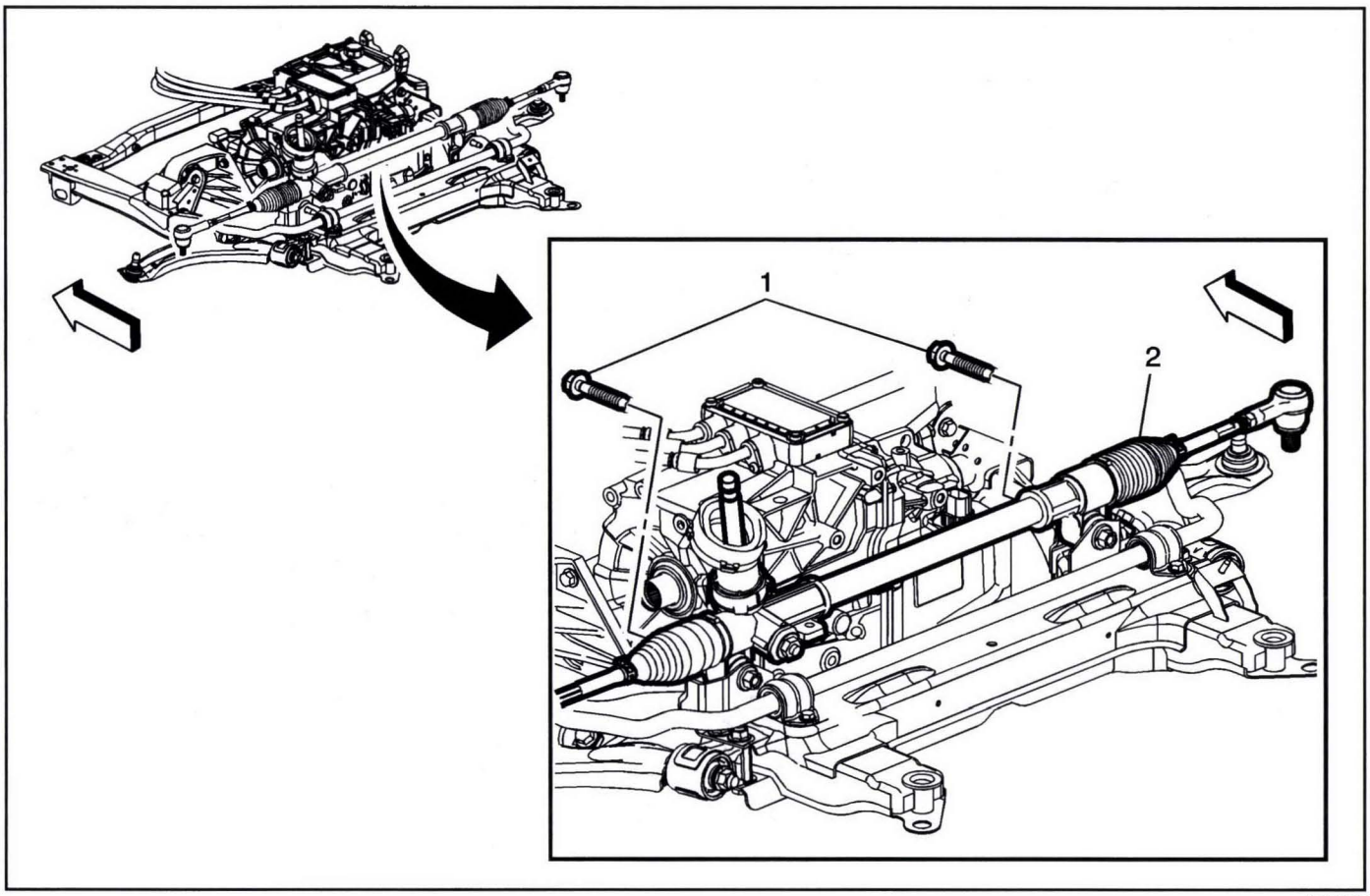
1. Before performing the procedure, review the high voltage safety information. Refer to *High Voltage Safety on page 9-362*.
2. Disable the high voltage system. Refer to *High Voltage Disabling on page 9-363*.

Caution: With wheels of the vehicle facing straight ahead, secure the steering wheel utilizing steering column anti-rotation pin, steering column lock, or a strap to prevent rotation. Locking of the steering column will prevent damage and a possible malfunction of the SIR system. The steering wheel must be secured in position before disconnecting the following components:

- The steering column
- The steering shaft coupling
- The intermediate shaft(s)

After disconnecting these components, do not rotate the steering wheel or move the front tires and wheels. Failure to follow this procedure may cause the SIR coil assembly to become un-centered and cause possible damage to the SIR coil. If you think the SIR coil has became un-centered, refer to your specific SIR coil's centering procedure to re-center SIR Coil.

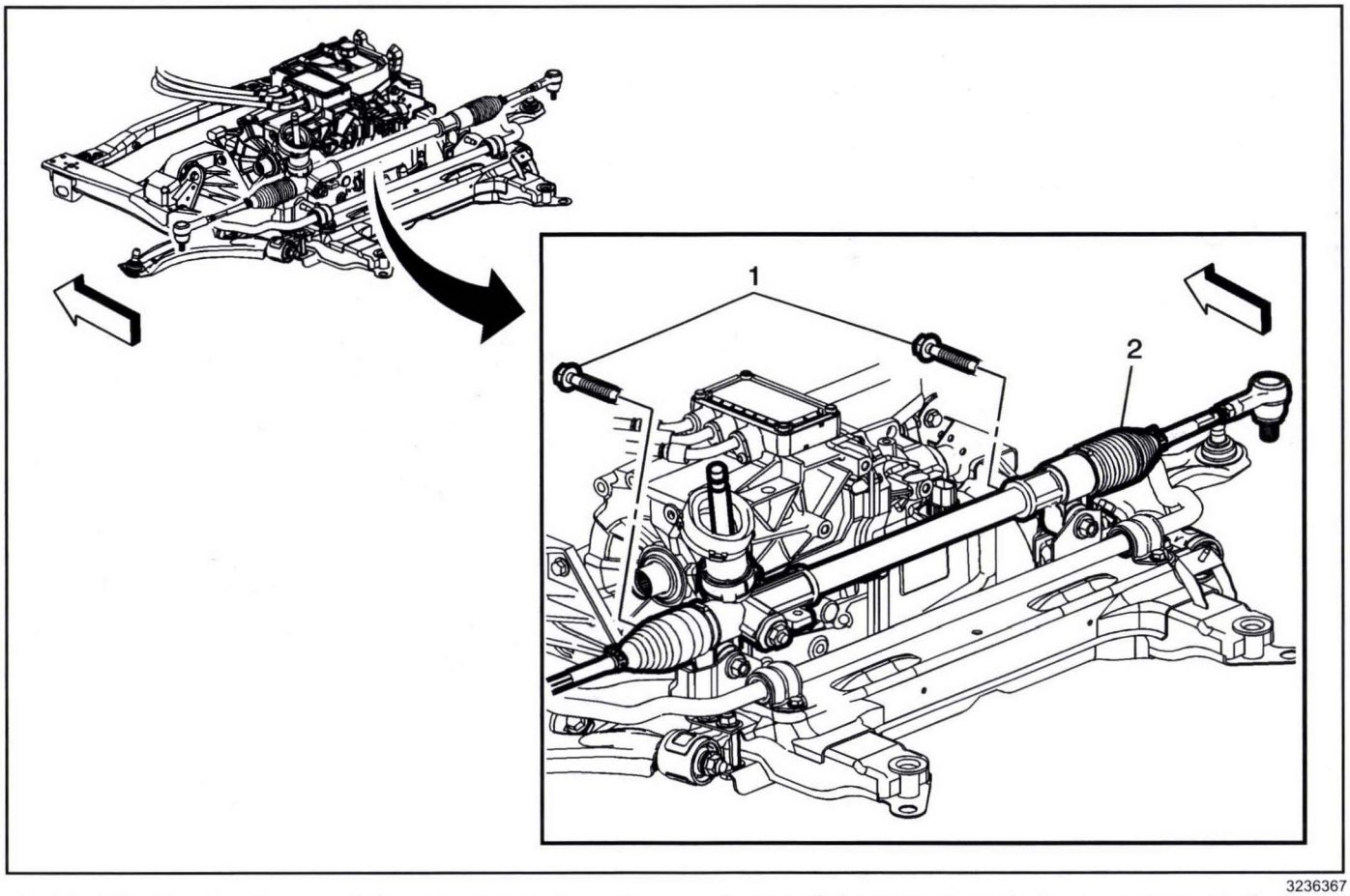
3. With the steering wheel in the straight ahead position, LOCK the steering column.
4. Disconnect the intermediate steering shaft from the steering gear. Refer to *Intermediate Steering Shaft Replacement on page 14-28*.
5. Remove the intermediate steering shaft inner boot. Refer to *Intermediate Steering Shaft Inner Boot Replacement on page 14-27*.
6. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*.
7. Remove the front tire and wheel assemblies. Refer to *Tire and Wheel Removal and Installation on page 15-51*.
8. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
9. Remove the front, middle and rear portions of the front compartment splash shield. Refer to *Front Compartment Splash Shield Replacement (Front) on page 3-119* or *Front Compartment Splash Shield Replacement (Middle) on page 3-120* or *Front Compartment Splash Shield Replacement (Rear) on page 3-121*.
10. Disconnect the stabilizer shaft links from the strut assemblies. Refer to *Stabilizer Shaft Link Replacement on page 15-5*.
11. Disconnect the steering linkage outer tie rods from the steering knuckles. Refer to *Steering Linkage Outer Tie Rod Replacement on page 14-14*.
12. Disconnect the transmission fluid pump motor cable connector. Refer to *Transmission Fluid Pump Replacement on page 16-39*.
13. Remove the rear transmission mount strut to frame bolts. Refer to *Transmission Mount Strut Replacement - Rear on page 16-52*.
14. Support the rear of the drivetrain and front suspension frame with adjustable jackstands.
15. Support the transmission with a hydraulic jack.
16. Remove the drivetrain and front suspension frame stabilizer brackets. Refer to *Drivetrain and Front Suspension Frame Stabilizer Bracket Replacement on page 3-131*.
17. Loosen the front drivetrain and front suspension frame bolts. Refer to *Drivetrain and Front Suspension Frame Replacement on page 3-131*.
18. Disconnect the upper conduit retainer bracket from the drivetrain front and electronic system power supply module frame and disconnect the lower conduit retainer bracket from the drivetrain and front suspension frame. Refer to *300-Volt Battery Positive and Negative Cable Replacement (Drive Motor Generator Power Inverter Module to Drive Motor Battery) on page 9-454* or *300-Volt Battery Positive and Negative Cable Replacement (Drive Motor Generator Power Inverter Module to High Voltage Battery Disconnect Module) on page 9-457*.
19. Lower the rear of the drivetrain and front suspension frame to obtain the necessary clearance to remove the steering gear.



3236367

20. Remove the steering gear bolts (1).
21. Remove the steering gear (2) from the drivetrain and front suspension frame.
22. Transfer components as necessary.

Installation Procedure



3236367

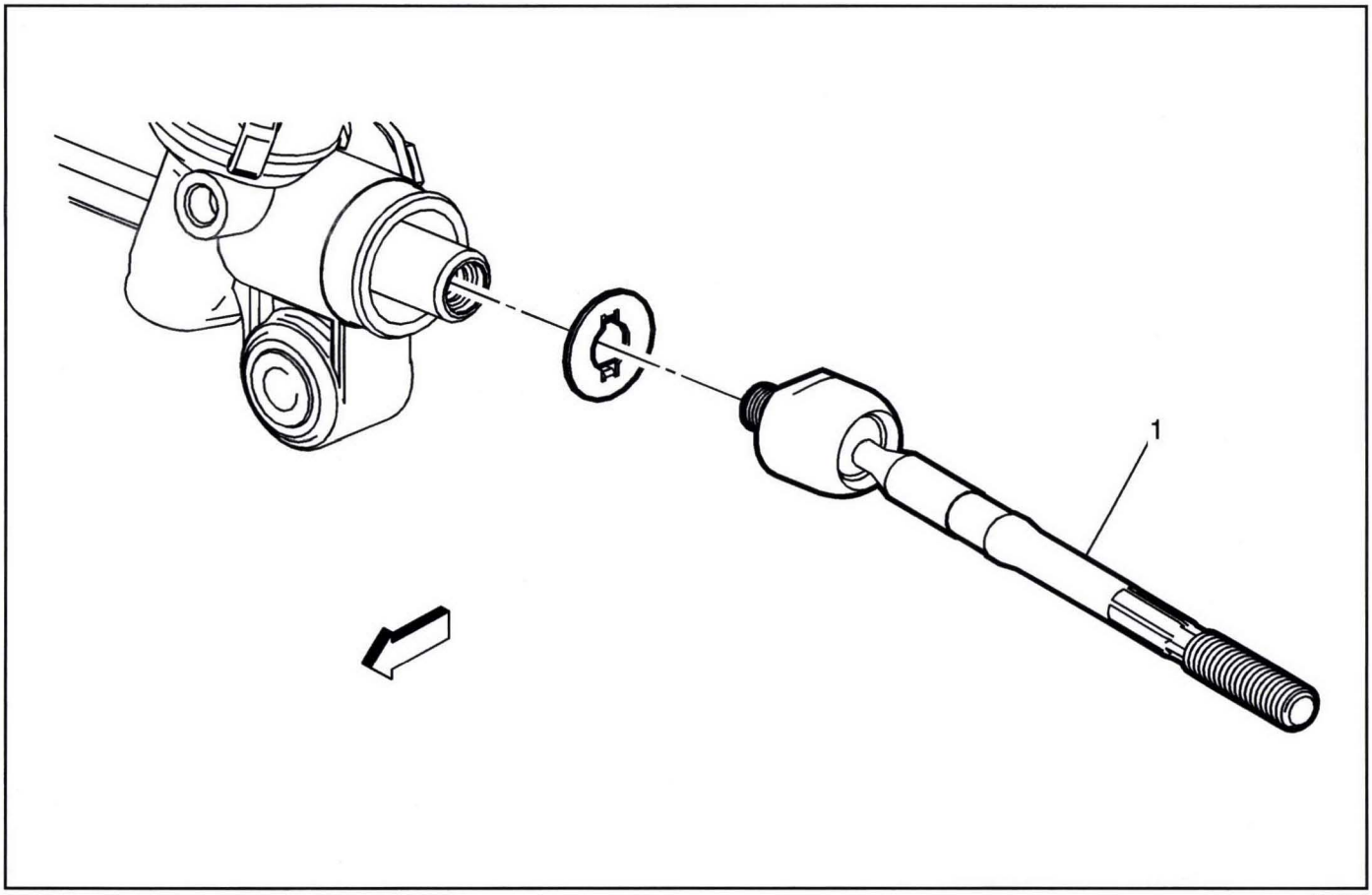
1. Position the steering gear (2) on the drivetrain and front suspension frame.

Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the steering gear bolts (1) and tighten to **110**N•m **(81 lb ft)**.
3. Raise the drivetrain and front suspension frame into position. Refer to *Drivetrain and Front Suspension Frame Replacement on page 3-131*.
4. Connect the lower conduit retainer bracket from the drivetrain and front suspension frame and connect the upper conduit retainer bracket to the drivetrain front and electronic system power supply module frame. Refer to *300-Volt Battery Positive and Negative Cable Replacement (Drive Motor Generator Power Inverter Module to Drive Motor Battery) on page 9-454* or *300-Volt Battery Positive and Negative Cable Replacement (Drive Motor Generator Power Inverter Module to High Voltage Battery Disconnect Module) on page 9-457*.
5. Install the drivetrain and front suspension frame stabilizer brackets. Refer to *Drivetrain and Front Suspension Frame Stabilizer Bracket Replacement on page 3-131*.
6. Tighten the front drivetrain and front suspension frame bolts. Refer to *Drivetrain and Front Suspension Frame Replacement on page 3-131*.
7. Remove the hydraulic jack and adjustable jackstands.
8. Install the rear transmission mount strut to frame bolts. Refer to *Transmission Mount Strut Replacement - Rear on page 16-52*.
9. Connect the transmission fluid pump motor cable connector. Refer to *Transmission Fluid Pump Replacement on page 16-39*.
10. Connect the steering linkage outer tie rods to the steering knuckles. Refer to *Steering Linkage Outer Tie Rod Replacement on page 14-14*.
11. Connect the stabilizer shaft links to the strut assemblies. Refer to *Stabilizer Shaft Link Replacement on page 15-5*.
12. Install the front, middle and rear portions of the front compartment splash shield. Refer to *Front Compartment Splash Shield Replacement (Front) on page 3-119* or *Front Compartment Splash Shield Replacement (Middle) on page 3-120* or *Front Compartment Splash Shield Replacement (Rear) on page 3-121*.
13. Install the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
14. Install the front tire and wheel assemblies. Refer to *Tire and Wheel Removal and Installation on page 15-51*.
15. Install the intermediate steering shaft inner boot. Refer to *Intermediate Steering Shaft Inner Boot Replacement on page 14-27*.

16. Connect the intermediate steering shaft to the steering gear. Refer to *Intermediate Steering Shaft Replacement on page 14-28*.
17. Unlock the steering column.
18. Enable the high voltage system. Refer to *High Voltage Enabling on page 9-367*.
19. Measure and adjust the front toe. Refer to *Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment on page 15-64*.
20. Center the steering angle sensor. Refer to *Steering Angle Sensor Centering on page 5-74*.

Steering Linkage Inner Tie Rod Replacement



3351940

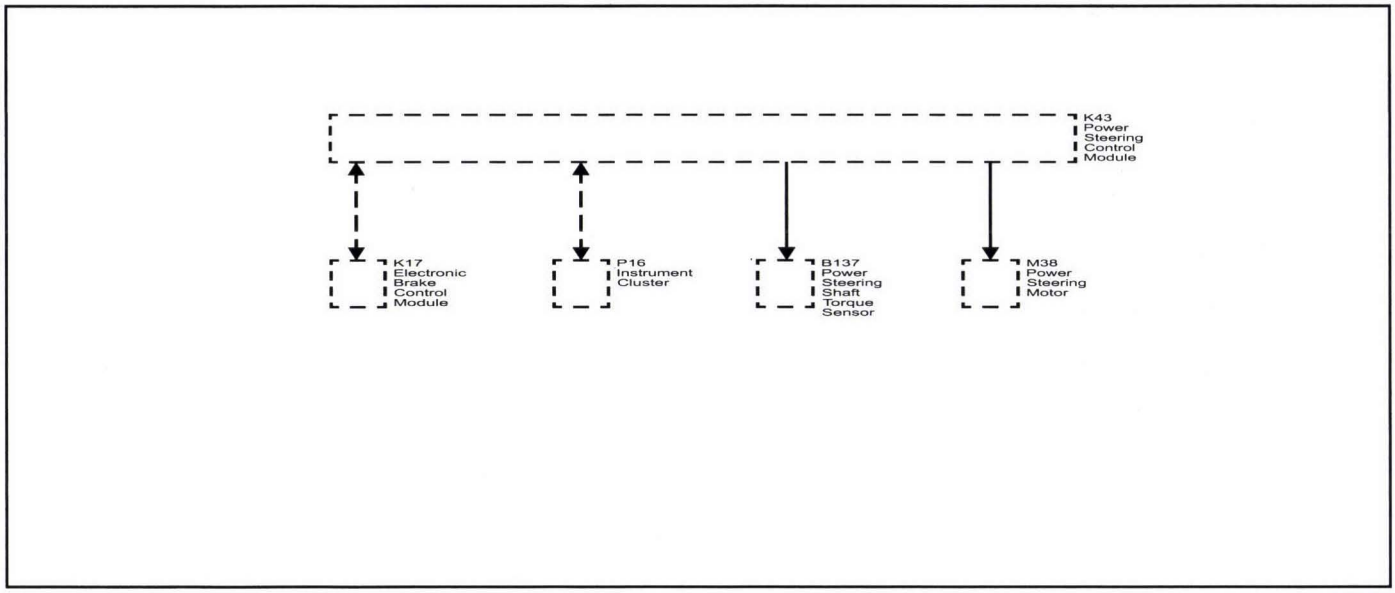
Steering Linkage Inner Tie Rod Replacement

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Remove the steering gear. Refer to *Steering Gear Replacement on page 14-18*. 3. Remove the steering gear boot. Refer to *Steering Gear Boot Replacement on page 14-15*.	
1	Steering Linkage Inner Tie Rod **Caution:** Refer to *Fastener Caution on page 0-8*. **Caution:** Do not change the steering gear preload adjustment before moving the inner tie rod from the steering gear. Changing the steering gear preload adjustment before moving the inner tie rod could result in damage to the pinion and the steering gear. **Procedure** 1. Place a wrench on the flats of the steering linkage inner tie rod housing. 2. Rotate the steering linkage inner tie rod housing counterclockwise in order to remove the steering linkage inner tie rod from the rack. 3. Rotate the steering linkage inner tie rod housing clockwise in order to install the steering linkage inner tie rod to the rack. **Tighten** 88 N•m (65 lb ft)

Description and Operation

Power Steering System Description and Operation (Electric Power Steering)

Electric Power Steering Block Diagram



3603736

The electric power steering system reduces the amount of effort needed to steer the vehicle. The system uses the body control module, power steering control module, torque sensor, discrete battery voltage supply circuit, electric power steering motor, serial data bus, and the instrument panel cluster message center to perform the system functions. Any electric power steering components diagnosed to be malfunctioning requires replacement of the steering column assembly, also known as the electric power steering assembly.

Torque Sensor

The power steering control module uses a torque sensor as it's main input for determining the amount of steering assist. The steering column has an input shaft, from the steering wheel to the torque sensor, and an output shaft, from the torque sensor to the steering shaft coupler. The input and output shafts are separated by a torsion bar, where the torque sensor is located. The sensor consists of a compensation coil, detecting coil and 3 detecting rings. These detecting rings have toothed edges that face each other. Detecting ring 1 is fixed to the output shaft, detecting rings 2 and 3 are fixed top the input shaft. The detecting coil is positioned around the toothed edges of detecting rings 1 and 2. As torque is applied to the steering column shaft the alignment of the teeth between detecting rings 1 and 2 changes, which causes the detecting coil signal voltage to change. The power steering control module recognizes this change in signal voltage as steering column shaft torque. The compensation coil is used to compensate for changes in electrical circuit impedance due to circuit temperature changes from the electrical current and voltage levels as well as ambient temperatures for accurate torque detection.

EPS Motor

The electric power steering motor is a 12-volt brushed DC reversible motor. The motor assists steering through a worm shaft and reduction gear located in the steering column housing.

Power Steering Control Module

The power steering control module uses a combination of torque sensor inputs, vehicle speed, calculated system temperature and the steering calibration to determine the amount of steering assist. When the steering wheel is turned, the power steering control module uses signal voltage from the torque sensor to detect the amount of torque being applied to the steering column shaft and the amount of current to command to the electric power steering motor. The power steering control module receives serial data from the engine control module to determine vehicle speed. At low speeds more assist is provided for easy turning during parking maneuvers. At high speeds, less assist is provided for improved road feel and directional stability. In this mode the power steering control module will limit the amount of current commanded to the electric power steering motor which reduces steering assist levels. The power steering control module also chooses which steering calibration to use when the ignition is turned ON, based on the production map number stored in the body control module. The power steering control module contains all 8 of the steering calibrations which are different in relation to the vehicles RPOs. The power steering control module has the ability to detect malfunctions within the electric power steering system. Any malfunction detected will cause the instrument panel cluster message center to display a warning message.

Special Tools and Equipment

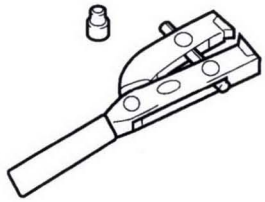
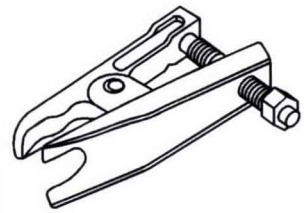
Illustration	Tool Number/Description
 2028192	CH-804 MKM-804 Boot Clamp Pliers

Illustration	Tool Number/Description
 1281175	DT-50049 KM-507–B Tie Rod End Puller

Steering Wheel and Column

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Intermediate Steering Shaft Lower Bolt	27 N•m	20 lb ft
Intermediate Steering Shaft Upper Bolt	22 N•m	16 lb ft
Steering Column Bolt	25 N•m	18 lb ft
Steering Column Nut	25 N•m	18 lb ft
Steering Wheel Nut	38 N•m	28 lb ft

Diagnostic Information and Procedures

Symptoms - Steering Wheel and Column

Note: Review the system operation in order to familiarize yourself with the system functions.

Refer to *Steering Wheel and Column Description and Operation on page 14-35*.

Symptoms List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- *High Effort While Tilting Column on page 14-24*
- *Noise in Steering Column on page 14-24*
- *Looseness in Steering Column on page 14-25*

High Effort While Tilting Column

Condition	Action
The pivot bolt is damaged or misaligned.	If necessary, replace the steering column. Refer to *Steering Column Replacement on page 14-34*.

Noise in Steering Column

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and perform the necessary inspections?	*Go to Step 2*	Go to *Symptoms - Steering Wheel and Column on page 14-24*
2	Verify that noise is present in the steering column during operation. Is noise present in the steering column during operation?	*Go to Step 3*	System OK
3	Inspect the steering column mounting features for the following conditions: • Steering column mounting fasteners for looseness • Steering column mounting features are sheared Are the steering column mounting features loose?	*Go to Step 9*	*Go to Step 4*
4	Inspect the SIR/SRS coil for noise. Is the SIR/SRS coil noisy?	*Go to Step 10*	*Go to Step 5*

Noise in Steering Column (cont'd)

Step	Action	Yes	No
5	Inspect the lock plate retaining ring for correct installation. Is the lock plate retaining ring installed incorrectly?	*Go to Step 11*	*Go to Step 6*
6	Inspect the steering column upper and lower bearings for the following conditions: • Damage • Lubrication • Wear • Proper seating Are the bearings in need of repair or replacement?	*Go to Step 12*	*Go to Step 7*
7	Does the tilt joint need to be lubricated?	*Go to Step 13*	*Go to Step 8*
8	**Note:** This is best evaluated while driving the vehicle, turning the steering and applying the brake pedal. Inspect the intermediate steering shaft for noise. Is the intermediate steering shaft noisy?	*Go to Step 14*	*Go to Step 15*
9	**Note:** If the steering column mounting is damaged or sheared, the steering column will need to be replaced. Refer to *Steering Column Replacement on page 14-34*. Tighten the steering column mounting fasteners to specifications. Refer to *Fastener Tightening Specifications on page 14-24*. Did you complete the repair?	*Go to Step 15*	—
10	Replace the SIR/SRS coil. Refer to *Steering Wheel Airbag Coil Replacement on page 12-158*. Did you complete the repair?	*Go to Step 15*	—
11	Install the lock plate retaining ring correctly. Did you complete the repair?	*Go to Step 15*	—
12	**Note:** If the steering column upper and/or lower bearings are not serviceable, the steering column will need to be replaced. Refer to *Steering Column Replacement on page 14-34*. Replace the upper and/or lower bearing, if serviceable. Did you complete the repair?	*Go to Step 15*	—
13	Lubricate the tilt joint. Did you complete the repair?	*Go to Step 15*	—
14	Replace the appropriate intermediate steering shaft component. Refer to *Intermediate Steering Shaft Replacement on page 14-28*. Did you complete the repair?	*Go to Step 15*	—
15	Operate the system in order to verify the repair. Did you correct the condition?	System OK	*Go to Step 3*

Looseness in Steering Column

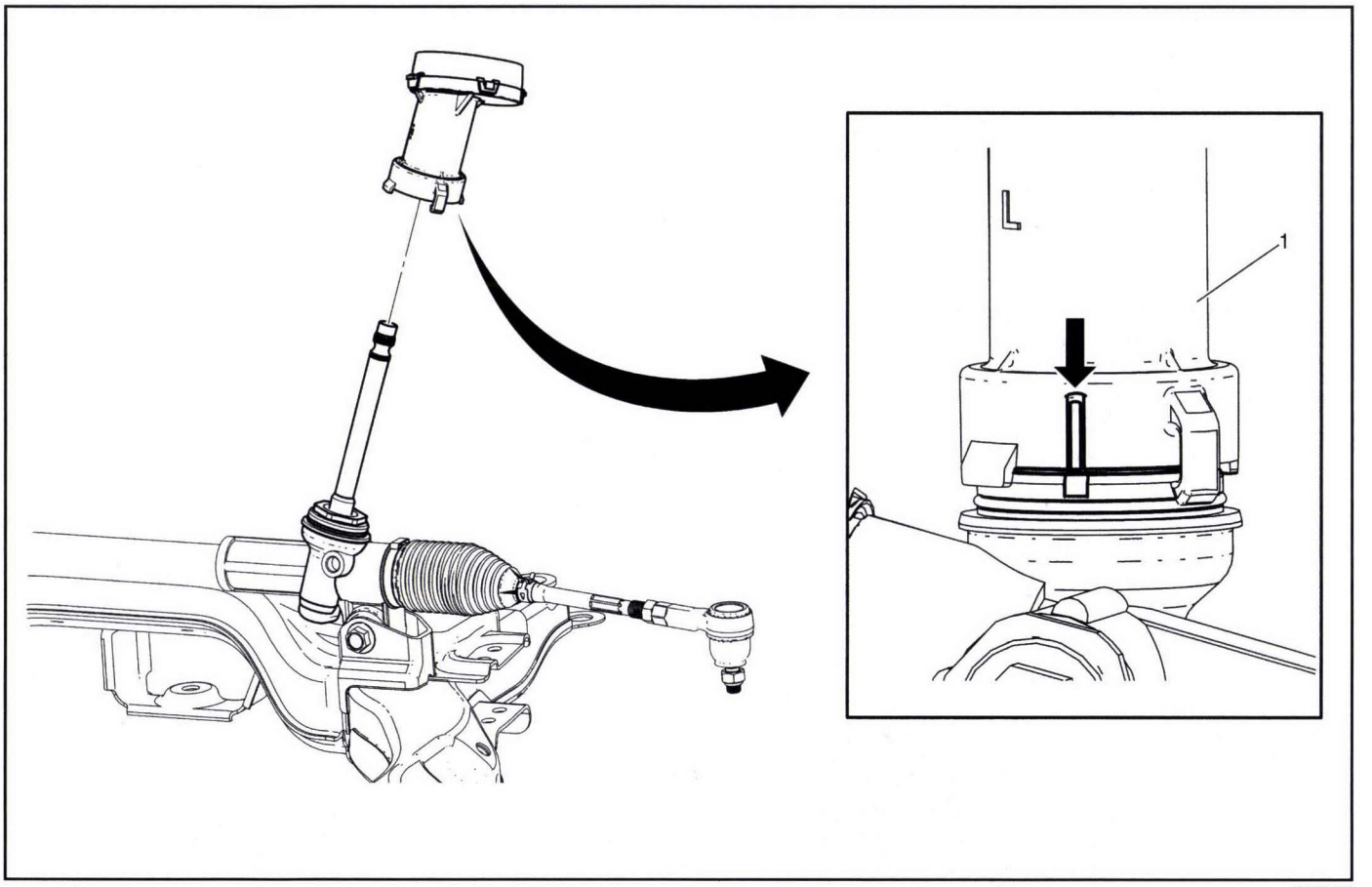
Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and perform the necessary inspections?	*Go to Step 2*	Go to *Steering Column Replacement on page 14-34*
2	Verify that the steering column is loose. Is the steering column loose?	*Go to Step 3*	System OK
3	Inspect the steering column mounting features for the following conditions. • Steering column mounting fasteners for looseness • Steering column mounting features are sheared Are the steering column mounting features loose?	*Go to Step 5*	*Go to Step 4*
4	Inspect the upper and/or lower bearings for looseness. Are any of the bearings worn or loose?	*Go to Step 6*	*Go to Step 7*

Looseness in Steering Column (cont'd)

Step	Action	Yes	No
5	**Note:** If the steering column mounting is damaged or sheared, the steering column will need to be replaced. Refer to *Steering Column Replacement on page 14-34*. Tighten the steering column mounting fastener to specifications. Refer to *Fastener Tightening Specifications on page 14-24*. Did you complete the repair?	*Go to Step 7*	—
6	**Note:** If the steering column mounting is damaged or sheared, the steering column will need to be replaced. Refer to *Steering Column Replacement on page 14-34*. Replace the upper and/or lower bearings, if serviceable. Did you complete the repair	*Go to Step 7*	—
7	Operate the system in order to verify the repair. Did you correct the condition?	System OK	*Go to Step 3*

Repair Instructions

Intermediate Steering Shaft Boot Replacement

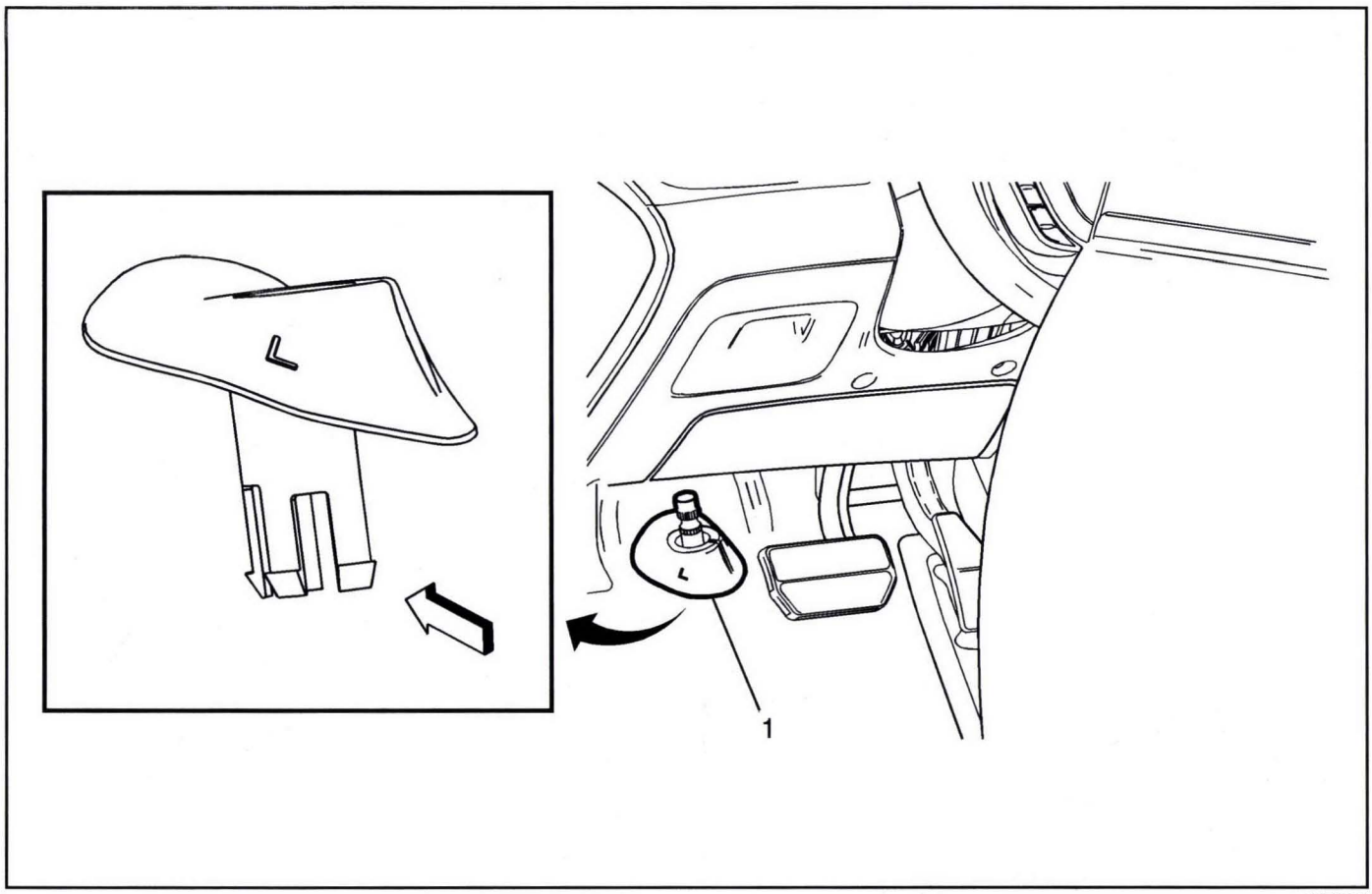


3266690

Intermediate Steering Shaft Boot Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the intermediate steering shaft inner boot. Refer to *Intermediate Steering Shaft Inner Boot Replacement on page 14-27*. 2. Lower the drivetrain and front suspension frame until enough space exists between the intermediate steering shaft boot and the frame to remove the boot over the intermediate steering shaft. Refer to *Steering Gear Replacement on page 14-18*.	
1	Intermediate Steering Shaft Boot **Procedure** When installing the intermediate steering shaft boot, align the nose of the boot to the groove on the steering gear.

Intermediate Steering Shaft Inner Boot Replacement



3240247

Intermediate Steering Shaft Inner Boot Replacement

Callout	Component Name
Preliminary Procedures Disconnect the intermediate steering shaft from the steering gear. Refer to *Intermediate Steering Shaft Replacement on page 14-28*.	
1	Intermediate Steering Shaft Inner Boot **Procedure** 1. To remove the intermediate steering shaft inner boot, lift the lip of the boot and use an appropriate tool to release the plastic clips holding the boot in place. 2. When installing the intermediate steering shaft inner boot, align the boot in the same position prior to removing and snap all plastic clips in place.

Intermediate Steering Shaft Replacement

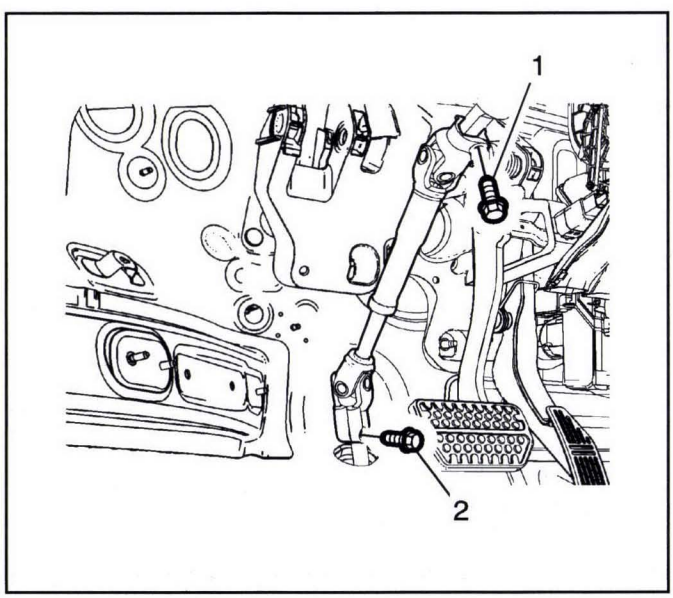
Removal Procedure

Caution: With wheels of the vehicle facing straight ahead, secure the steering wheel utilizing steering column anti-rotation pin, steering column lock, or a strap to prevent rotation. Locking of the steering column will prevent damage and a possible malfunction of the SIR system. The steering wheel must be secured in position before disconnecting the following components:

- The steering column
- The steering shaft coupling
- The intermediate shaft(s)

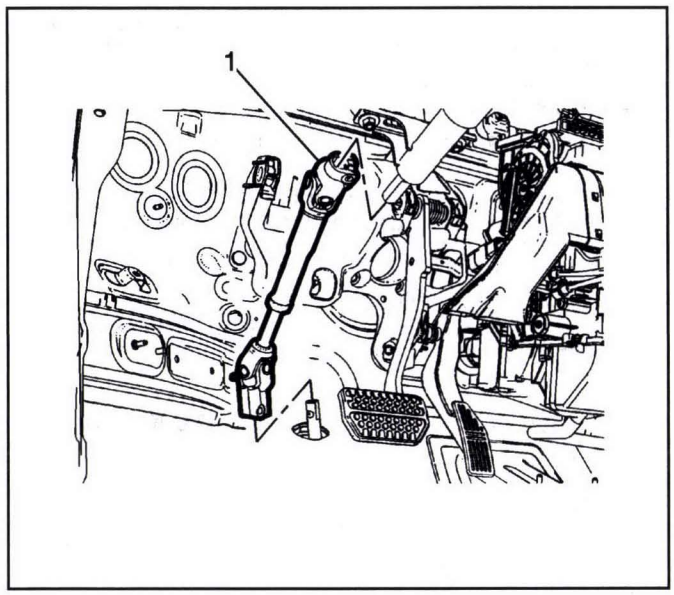
After disconnecting these components, do not rotate the steering wheel or move the front tires and wheels. Failure to follow this procedure may cause the SIR coil assembly to become un-centered and cause possible damage to the SIR coil. If you think the SIR coil has became un-centered, refer to your specific SIR coil's centering procedure to re-center SIR Coil.

1. With the steering wheel in the straight ahead position, LOCK the steering column.
2. Remove the instrument panel knee bolster. Refer to *Instrument Panel Knee Bolster Replacement on page 2-22*.
3. Remove the driver side instrument panel lower airbag. Refer to *Instrument Panel Lower Airbag Replacement - Driver Side on page 12-160*.



3416558

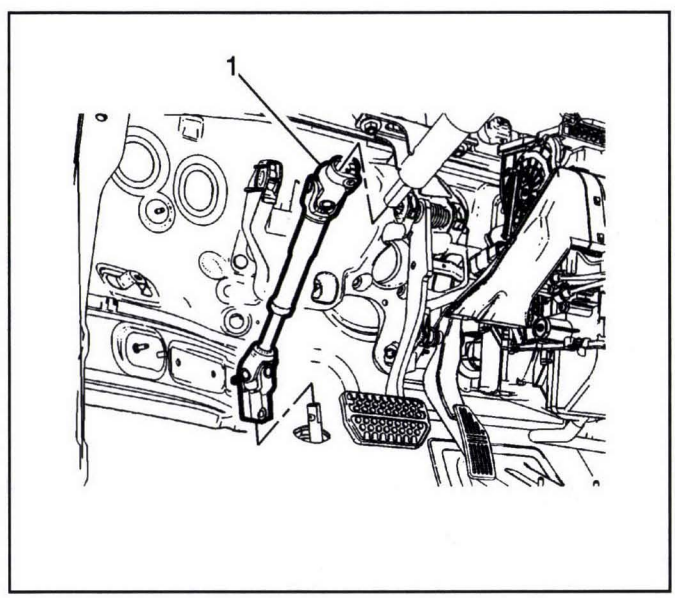
4. Remove the intermediate steering shaft upper bolt (1) and lower bolt (2).



3239974

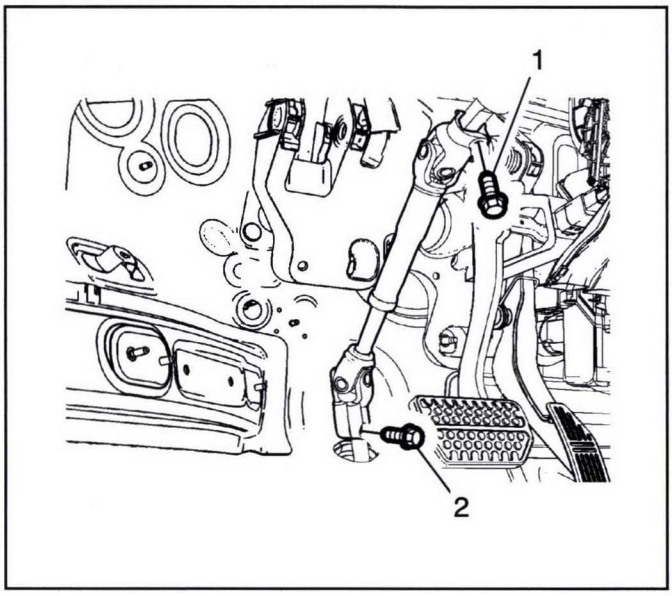
5. Remove the intermediate steering shaft (1) from the vehicle.

Installation Procedure



3239974

1. Position the intermediate steering shaft (1) in the vehicle.
2. Align the matching splines on the steering column shaft and the intermediate steering shaft and connect the two shafts. Ensure the teeth on both shafts are aligned correctly before meshing the shafts together.
3. Align the matching splines on the steering gear pinion shaft and the intermediate steering shaft and connect the two shafts. Ensure the teeth on both shafts are aligned correctly before meshing the shafts together.

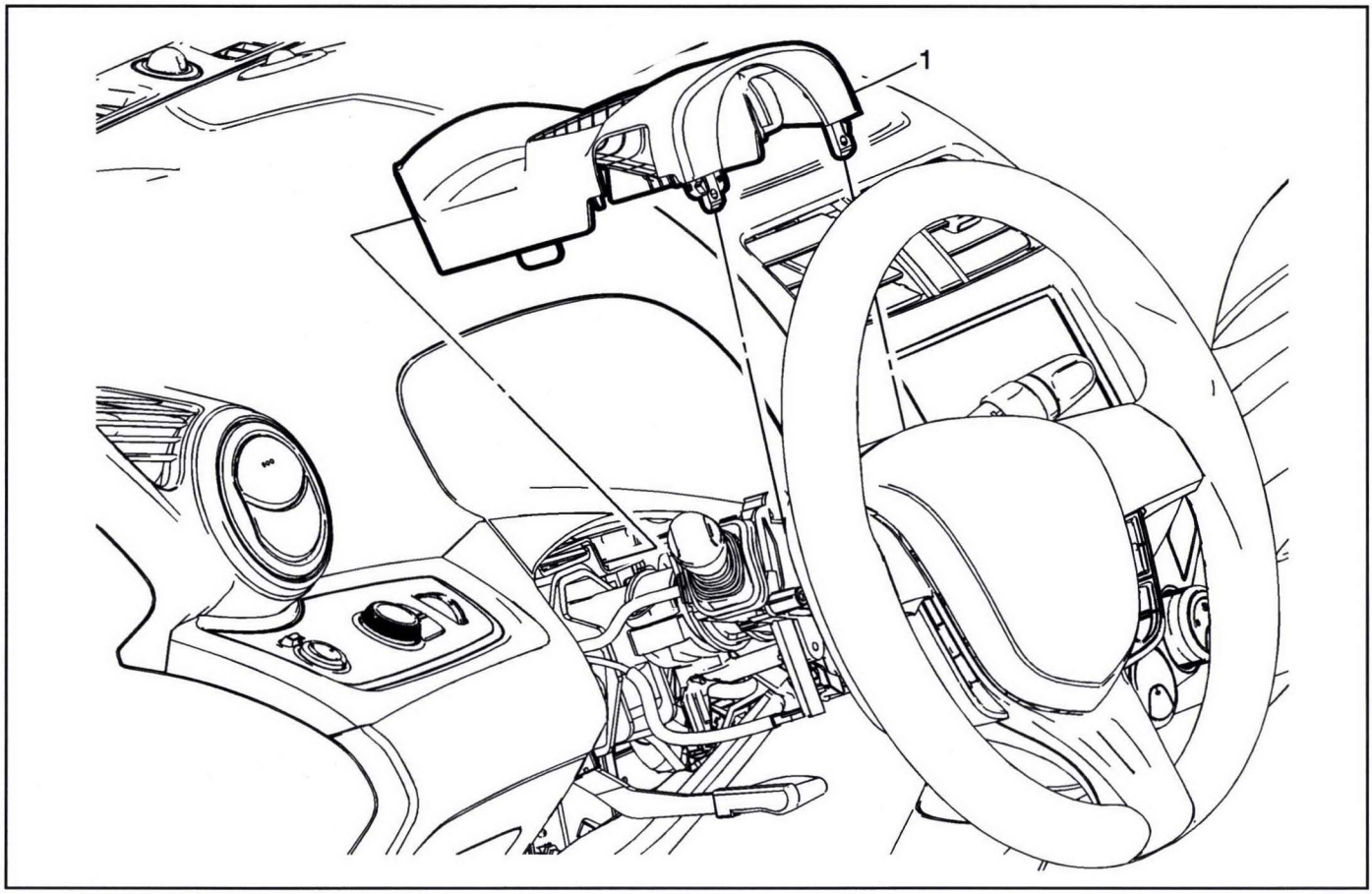


3416558

Caution: Refer to *Fastener Caution on page 0-8*.

4. Install the intermediate steering shaft lower bolt (2) and tighten to **27 N•m (20 lb ft)**.
5. Install the intermediate steering shaft upper bolt (1) and tighten to **22 N•m (16 lb ft)**.
6. Install the driver side instrument panel lower airbag. Refer to *Instrument Panel Lower Airbag Replacement - Driver Side on page 12-160*.
7. Install the instrument panel knee bolster. Refer to *Instrument Panel Knee Bolster Replacement on page 2-22*.

Steering Column Upper Trim Cover Replacement

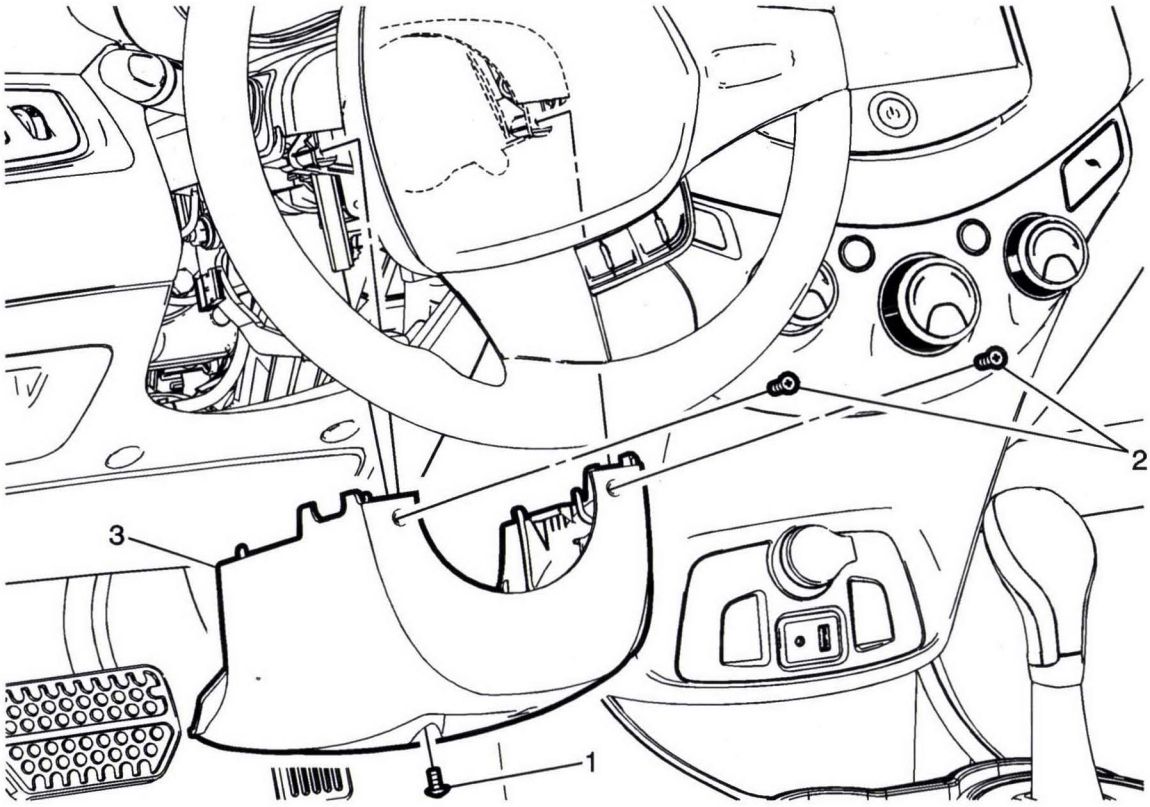


2963989

Steering Column Upper Trim Cover Replacement

Callout	Component Name
Preliminary Procedure Remove the instrument cluster. Refer to *Instrument Cluster Replacement on page 8-95*.	
1	Steering Column Upper Trim Cover

Steering Column Lower Trim Cover Replacement

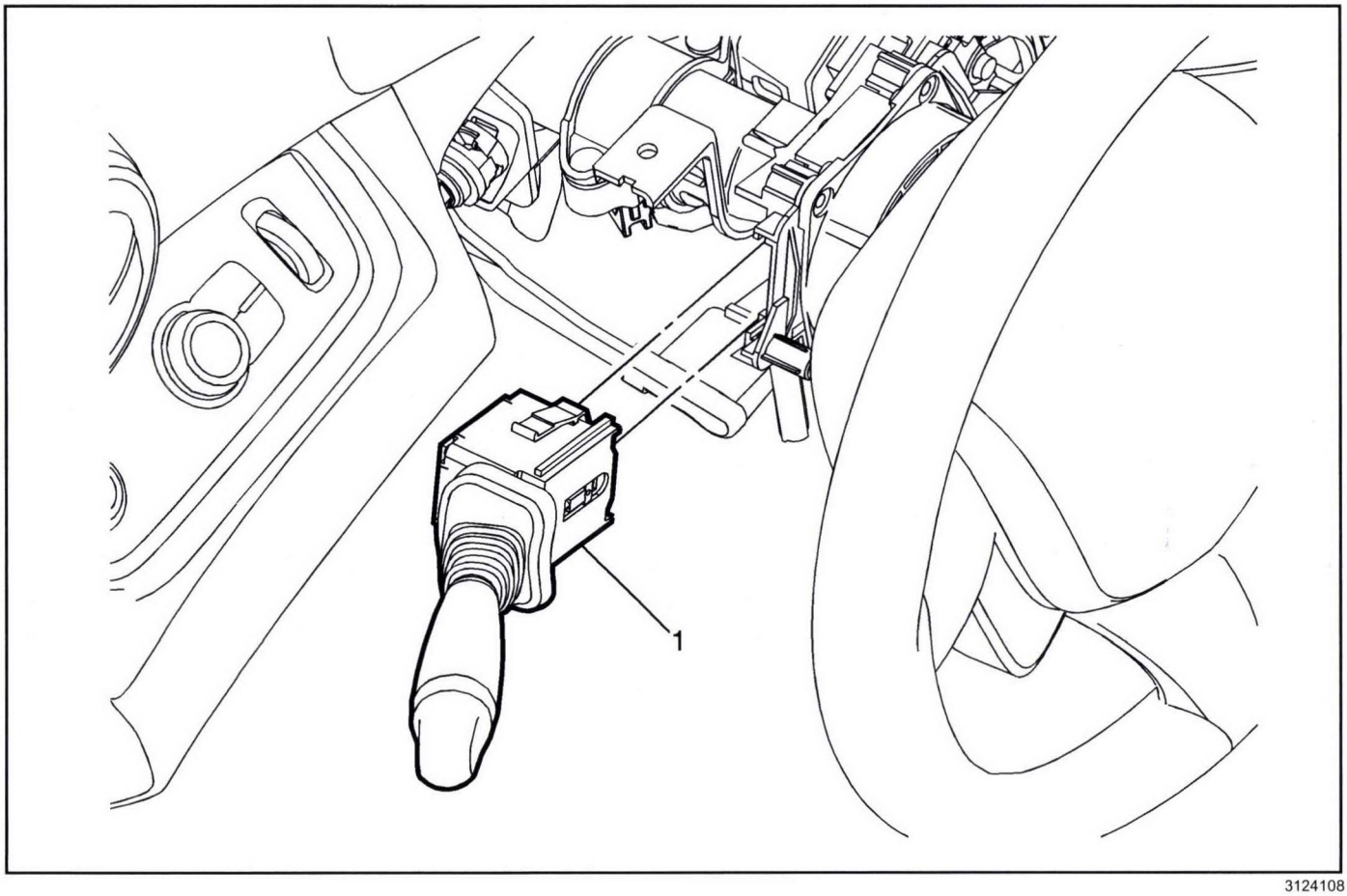


2963988

Steering Column Lower Trim Cover Replacement

Callout	Component Name
1	Steering Column Lower Trim Cover Screw (Qty: 1) **Caution:** Refer to *Fastener Caution on page 0-8*.
2	Steering Column Upper Trim Cover Screw (Qty: 2)
3	Steering Column Lower Trim Cover **Procedure** Turn the steering wheel left and right to access the fasteners securing the lower trim cover to the turn signal switch bracket.

Turn Signal Switch Replacement

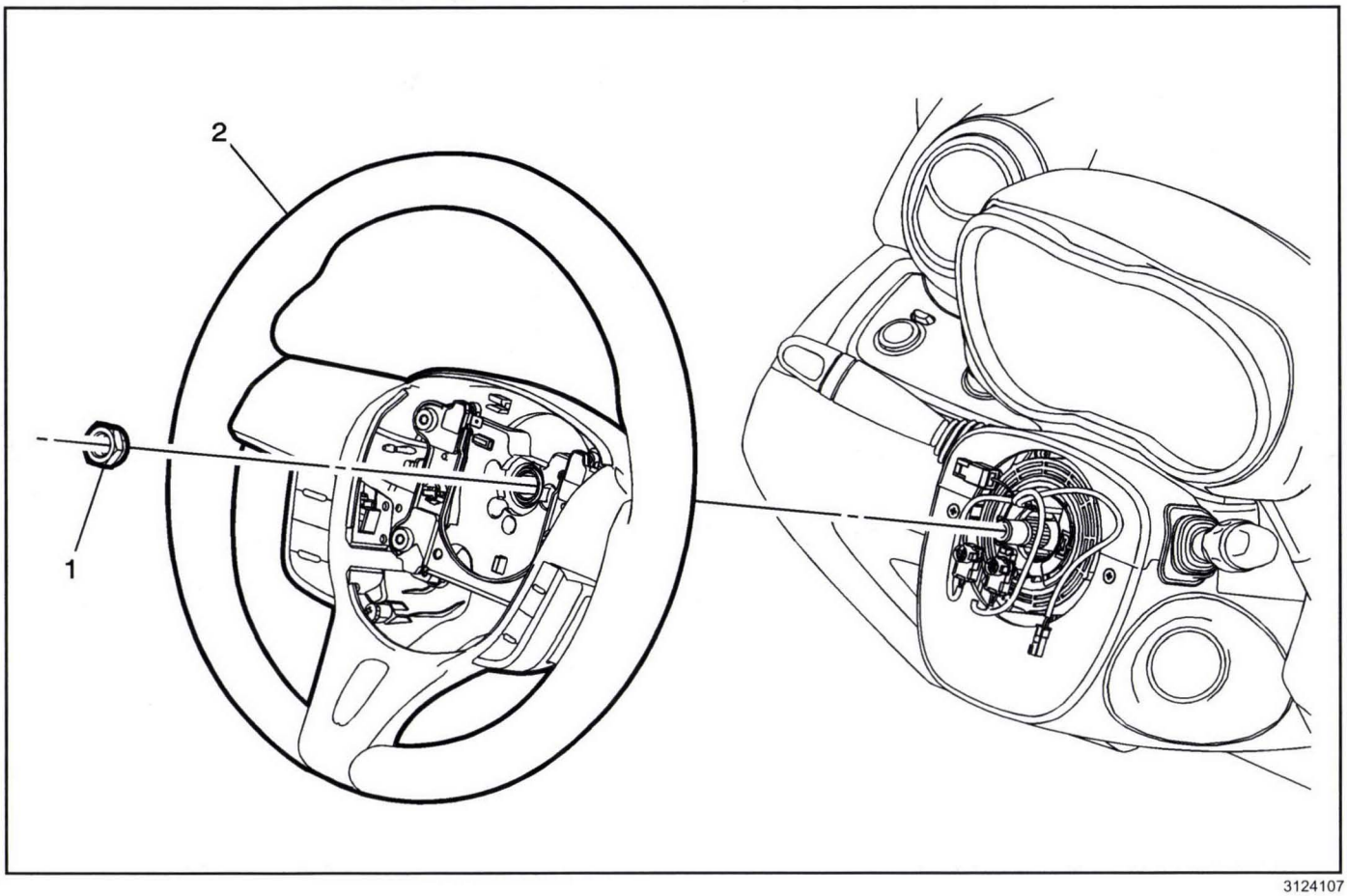


3124108

Turn Signal Switch Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the steering column lower trim cover. Refer to *Steering Column Lower Trim Cover Replacement on page 14-30*. 2. Remove the instrument cluster. Refer to *Instrument Cluster Replacement on page 8-95*. 3. Remove the steering column upper trim cover. Refer to *Steering Column Upper Trim Cover Replacement on page 14-29*.	
1	Turn Signal Switch **Procedure** 1. Disconnect any electrical connectors. 2. Release the retaining tabs and remove the turn signal switch from the steering column.

Steering Wheel Replacement

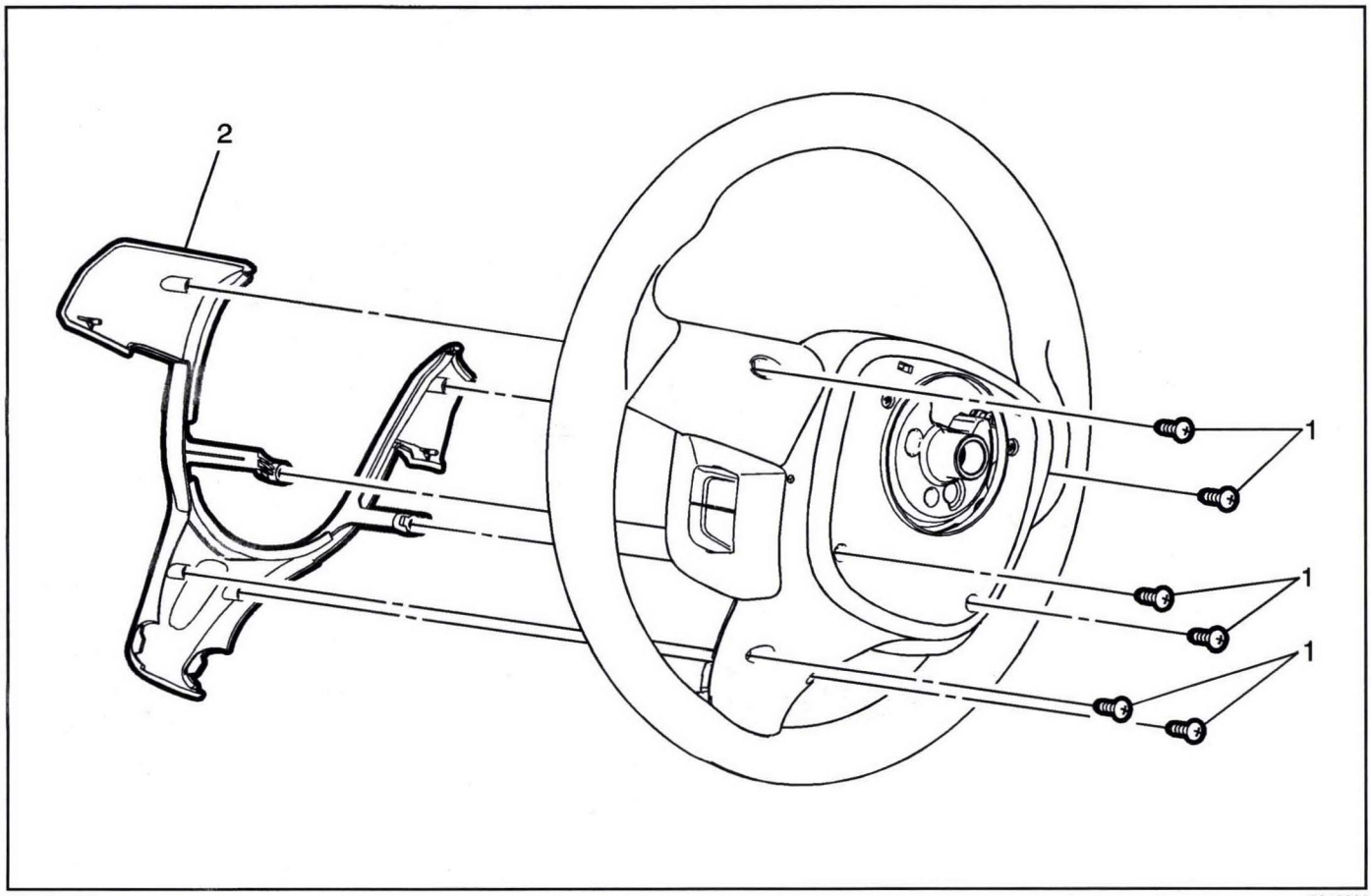


3124107

Steering Wheel Replacement

Callout	Component Name
Preliminary Procedure Remove the steering wheel airbag. Refer to *Steering Wheel Airbag Replacement on page 12-155*.	
1	Steering Wheel Nut **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 38 N•m (28 lb ft)
2	Steering Wheel **Procedure** 1. Disconnect any electrical connectors. 2. Use the *CH-50168–A* puller to remove the steering wheel from the steering column. **Special Tools** *CH-50168-A* Steering Wheel Puller For equivalent regional tools, refer to *Special Tools on page 14-36*.

Steering Wheel Spoke Lower Cover Replacement

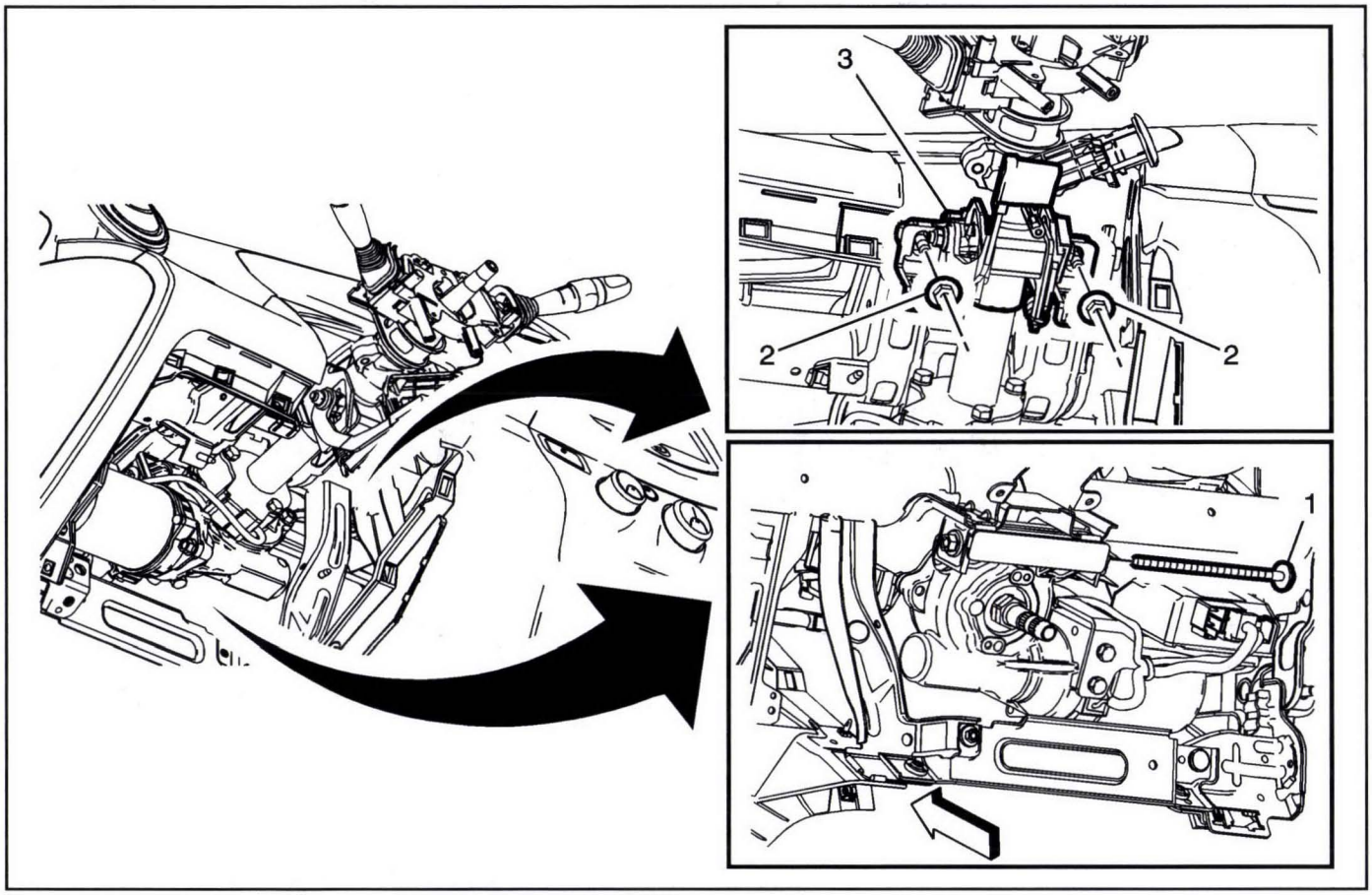


3212602

Steering Wheel Spoke Lower Cover Replacement

Callout	Component Name
Preliminary Procedure Remove the steering wheel. Refer to *Steering Wheel Replacement on page 14-32*.	
1	Steering Wheel Spoke Lower Cover Fasteners (Qty: 6) **Caution:** Refer to *Fastener Caution on page 0-8*.
2	Steering Wheel Spoke Lower Cover

Steering Column Replacement



3421647

Steering Column Replacement

Callout	Component Name

Warning: Refer to SIR Inflator Module Handling and Storage Warning on page 0-6.

Warning: Refer to SIR Warning on page 0-7.

Caution: With wheels of the vehicle facing straight ahead, secure the steering wheel utilizing steering column anti-rotation pin, steering column lock, or a strap to prevent rotation. Locking of the steering column will prevent damage and a possible malfunction of the SIR system. The steering wheel must be secured in position before disconnecting the following components:

- The steering column
- The steering shaft coupling
- The intermediate shaft(s)

After disconnecting these components, do not rotate the steering wheel or move the front tires and wheels. Failure to follow this procedure may cause the SIR coil assembly to become un-centered and cause possible damage to the SIR coil. If you think the SIR coil has became un-centered, refer to your specific SIR coil's centering procedure to re-center SIR Coil.

Preliminary Procedures

1. Disable the supplemental inflatable restraint (SIR) system. Refer to *SIR Disabling and Enabling on page 12-151*.
2. Remove the steering wheel. Refer to *Steering Wheel Replacement on page 14-32*.
3. Remove the steering column lower trim cover. Refer to *Steering Column Lower Trim Cover Replacement on page 14-30*.
4. Remove the instrument cluster. Refer to *Instrument Cluster Replacement on page 8-95*.
5. Remove the steering column upper trim cover. Refer to *Steering Column Upper Trim Cover Replacement on page 14-29*.
6. Remove the steering wheel airbag coil. Refer to *Steering Wheel Airbag Coil Replacement on page 12-158*.
7. Remove the instrument panel knee bolster. Refer to *Instrument Panel Knee Bolster Replacement on page 2-22*.
8. Remove the driver side instrument panel lower airbag. Refer to *Instrument Panel Lower Airbag Replacement - Driver Side on page 12-160*.
9. Disconnect the intermediate steering shaft from the steering column. Refer to *Intermediate Steering Shaft Replacement on page 14-28*.

Steering Column Replacement (cont'd)

Callout	Component Name
1	Steering Column Bolt **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 25 N•m (18 lb ft)
2	Steering Column Nut (Qty: 2) **Tighten** 25 N•m (18 lb ft)
3	Steering Column **Caution:** Once the steering column is removed from the vehicle, the column is extremely susceptible to damage. Dropping the column assembly on the end could collapse the steering shaft or loosen the plastic injections, which maintain column rigidity. Leaning on the column assembly could cause the jacket to bend or deform. Any of the above damage could impair the columns collapsible design. Do NOT hammer on the end of the shaft, because hammering could loosen the plastic injections, which maintain column rigidity. If you need to remove the steering wheel, refer to the Steering Wheel Replacement procedure in this section. **Procedure** 1. Disconnect any electrical connectors. 2. If replacing the steering column, transfer components as necessary. 3. Set up the power steering control module. Refer to *Power Steering Control Module Programming and Setup on page 6-15*. 4. Center the steering angle sensor. Refer to *Steering Angle Sensor Centering on page 5-74*.

Description and Operation

Steering Wheel and Column Description and Operation

The steering wheel and column has 4 primary functions:

- Vehicle steering
- Vehicle security
- Driver convenience
- Driver safety

Vehicle Steering

The steering wheel is the first link between the driver and the vehicle. The steering wheel is fastened to a steering shaft within the column. At the lower end of the column, the intermediate shaft connects the column to the steering gear.

The steering column can be adjusted vertically and longitudinally.

Vehicle Security

Theft deterrent components are mounted and designed into the steering column. The following components allow the column to be locked in order to minimize theft:

- The ignition switch
- The steering column lock
- The ignition cylinder
- The theft deterrent immobilizer module, if equipped

Driver Convenience

The steering wheel and column may also have driver controls attached for convenience and comfort. The following controls may be mounted on the steering wheel or column.

- The turn signal switch
- The headlamp dimmer switch
- The wiper/washer switch
- The horn pad
- The redundant radio/entertainment system controls
- The tilt functions
- The telephone system controls

Driver Safety

The steering wheel and column has safety features to protect the driver. The following components may be mounted on or near the steering column:

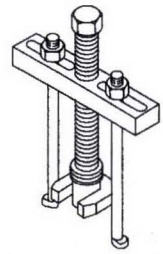
Energy-Absorbing Steering Column: The energy-absorbing steering column compresses in the event of a front-end collision, which reduces the chance of injury to the driver. The energy-absorbing feature, collapsible steering shaft, and break away mounting features help reduce the injury in the event of an accident.

SIR Coil and Module: For additional information on the operation of the SIR coil and module, refer to *Supplemental Inflatable Restraint System Description and Operation on page 12-182*.

Steering Wheel Angle Sensor: The steering wheel angle sensor is located somewhere along the steering shaft assembly. The sensor measures the position of the steering wheel and the speed at which it is rotated. A signal representing this measurement is provided to the electronic stability control (ESC) in the ABS module.

The Theft Deterrent Immobilizer Module: The immobilizer module is mounted in the steering column lock on cars without Passive Entry Passive Start system (PEPS). Refer to *Immobilizer Description and Operation on page 12-32*.

Special Tools and Equipment

Illustration	Tool Number/ Description
 2846147	CH-50168-A Steering Wheel Puller

Section 15

Suspension

Front Suspension 15-3
Specifications 15-3
Fastener Tightening Specifications 15-3
Repair Instructions 15-4
Stabilizer Shaft Replacement 15-4
Stabilizer Shaft Link Replacement 15-5
Front Wheel Bearing and Hub Replacement 15-5
Steering Knuckle Replacement 15-7
Lower Control Arm Replacement 15-9
Front Lower Control Arm Rear Bushing Replacement 15-11
Wheel Stud Replacement 15-12
Strut Assembly Removal and Installation 15-13
Suspension Shock/Strut Disposal 15-15
Strut, Strut Component, or Spring Replacement 15-15
Description and Operation 15-17
Front Suspension Description and Operation 15-17
Special Tools and Equipment 15-17

Rear Suspension 15-19
Specifications 15-19
Fastener Tightening Specifications 15-19
Repair Instructions 15-19
Rear Wheel Bearing and Hub Replacement ... 15-19
Shock Absorber Replacement 15-22
Rear Coil Spring Replacement 15-23
Rear Axle Replacement 15-24
Wheel Stud Replacement 15-26
Description and Operation 15-27
Rear Suspension Description and Operation 15-27
Special Tools and Equipment 15-27

Suspension General Diagnosis 15-28
Specifications 15-28
Trim Height Specifications 15-28
Diagnostic Information and Procedures 15-28
Symptoms - Suspension General Diagnosis 15-28
Ride Diagnosis 15-28
Vehicle Leads/Pulls 15-29
Body Leans or Sways in Corners 15-30
Suspension Bottoms 15-30
Torque Steer 15-30
Memory Steer 15-31
Noise Diagnosis - Front Suspension 15-32
Noise Diagnosis - Rear Suspension 15-33
Suspension Strut and Shock Absorber Testing - On Vehicle 15-34
Wheel Bearings Diagnosis 15-34
Trim Height Inspection 15-35

Tire Pressure Monitoring 15-37
Specifications 15-37
Fastener Tightening Specifications 15-37
Diagnostic Information and Procedures 15-38
DTC C0569 15-38
DTC C0750, C0755, C0760, or C0765 15-39
DTC C0775 15-41
Symptoms - Tire Pressure Monitoring 15-41
Low Tire Pressure Indicator Malfunction 15-42
Repair Instructions 15-43
Tire Pressure Indicator Sensor Replacement 15-43
Tire Pressure Indicator Sensor Learn 15-44
Description and Operation 15-46
Tire Pressure Monitor Description and Operation 15-46
Special Tools and Equipment 15-47

Tires and Wheels 15-48
Specifications 15-48
Tire and Wheel Specifications 15-48
Fastener Tightening Specifications 15-48
Adhesives, Fluids, Lubricants, and Sealers ... 15-48
Diagnostic Information and Procedures 15-49
Tire Diagnosis - Irregular or Premature Wear 15-49
Tire Diagnosis - Waddle Complaint 15-49
Radial Tire Lead/Pull Correction 15-50
Repair Instructions 15-50
Aluminum Wheel Porosity Repair 15-50
Aluminum Wheel Refinishing 15-51
Tire and Wheel Removal and Installation 15-51
Tire Repair 15-52
Tire Dismounting and Mounting 15-56
Tire and Wheel Balancing 15-56
Description and Operation 15-60
General Description 15-60
P-Metric Sized Tires Description 15-60
Replacement Wheels Description 15-61
Tire Inflation Description 15-61

Wheel Alignment 15-63
Specifications 15-63
Wheel Alignment Specifications 15-63
Fastener Tightening Specifications 15-63
Repair Instructions 15-63
Wheel Alignment Measurement 15-63
Front Caster Adjustment 15-64
Front Camber Adjustment 15-64
Wheel Alignment - Steering Wheel Angle and/ or Front Toe Adjustment 15-64
Description and Operation 15-64
Camber Description 15-64
Caster Description 15-65
Lead/Pull Description 15-65
Memory Steer Description 15-65
Scrub Radius Description 15-65
Thrust Angles Description 15-65
Toe Description 15-66
Torque Steer Description 15-66
Wander Description 15-66

Front Suspension

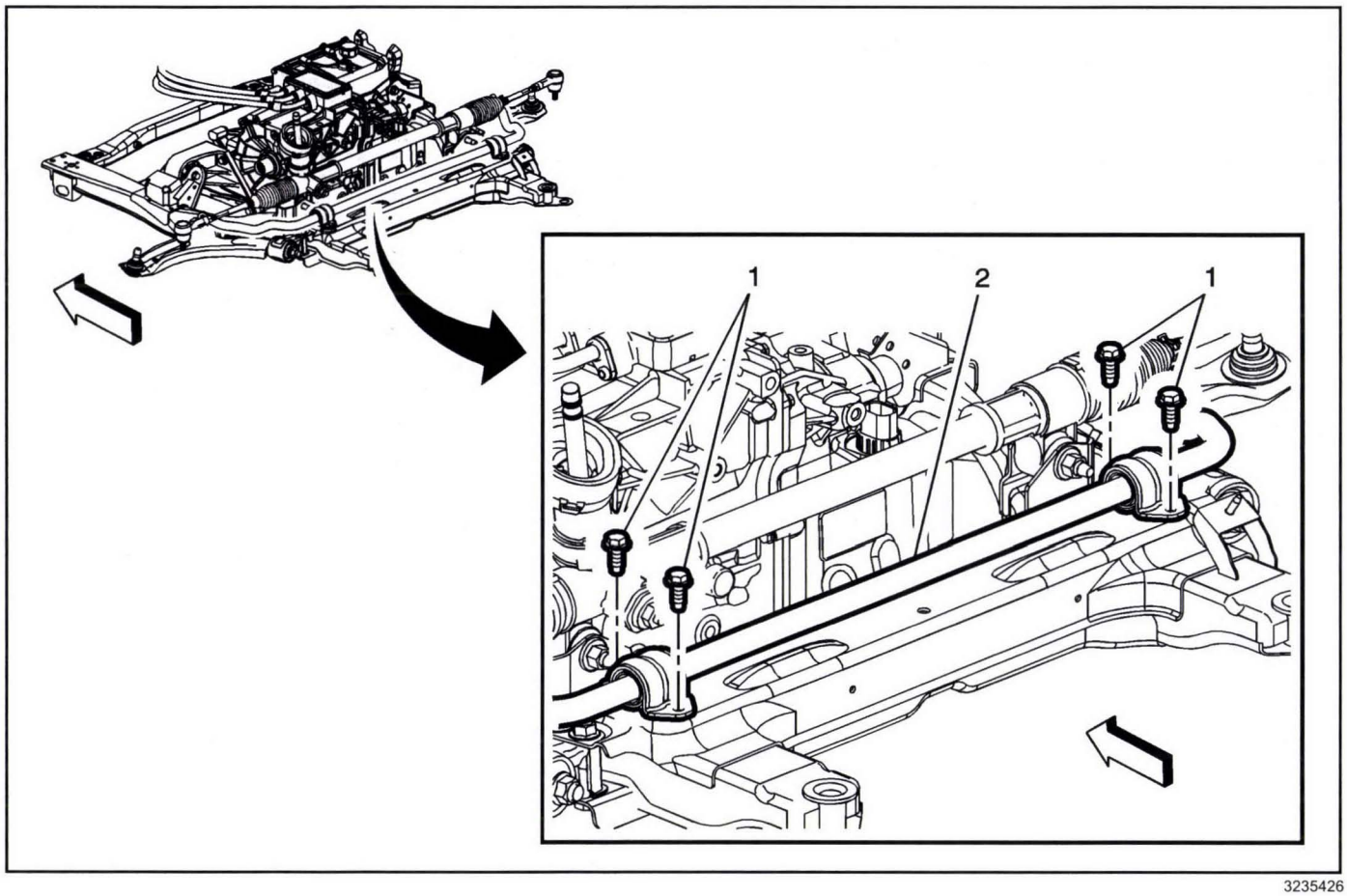
Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front Lower Control Arm Front Bolt	110 N•m	81 lb ft
Front Lower Control Arm Rear Bolt	110 N•m	81 lb ft
Front Lower Control Arm Rear Bushing Nut		
First Pass	110 N•m	81 lb ft
Final Pass	plus 53 degrees	
Front Stabilizer Shaft Insulator Clamp Bolt	25 N•m	18 lb ft
Front Stabilizer Shaft Link Nut	43 N•m	32 lb ft
Front Suspension Strut Lower Mounting Nut	65 N•m	48 lb ft
Front Suspension Strut Nut (at Steering Knuckle)		
First Pass	80 N•m	59 lb ft
Final Pass	plus 30 to 45 degrees	
Front Suspension Strut Upper Mounting Nut	65 N•m	48 lb ft
Steering Knuckle Bolt (at Lower Control Arm)	63 N•m	46 lb ft

Repair Instructions

Stabilizer Shaft Replacement

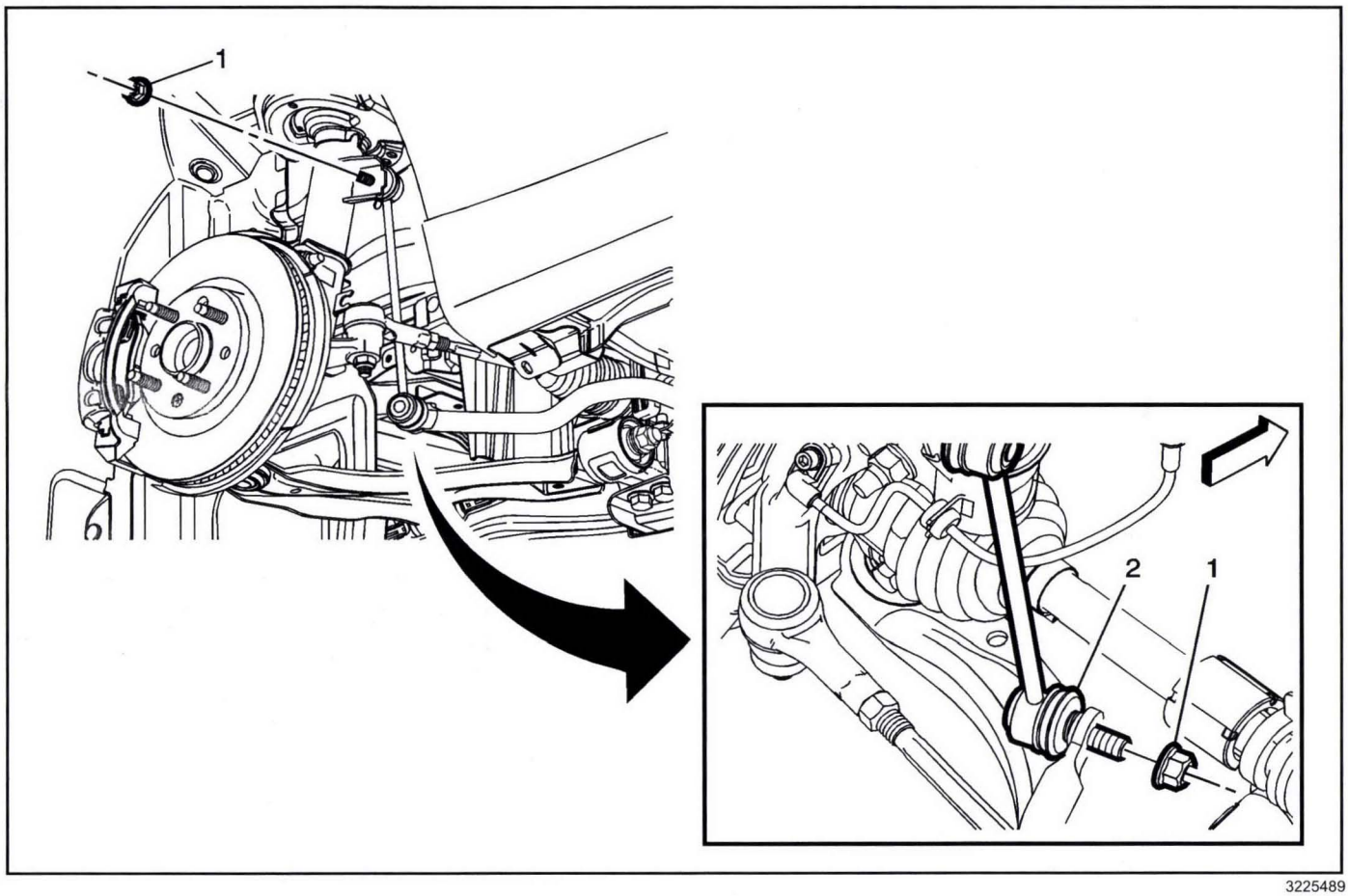


3235426

Stabilizer Shaft Replacement

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Remove the front tire and wheel assemblies. Refer to *Tire and Wheel Removal and Installation on page 15-51*. 3. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*. 4. Remove middle and rear sections of the front compartment splash shield. Refer to *Front Compartment Splash Shield Replacement (Front) on page 3-119* or *Front Compartment Splash Shield Replacement (Middle) on page 3-120* or *Front Compartment Splash Shield Replacement (Rear) on page 3-121*. 5. Disconnect the steering linkage outer tie rods from the steering knuckles. Refer to *Steering Linkage Outer Tie Rod Replacement on page 14-14*. 6. Remove the stabilizer shaft links. Refer to *Stabilizer Shaft Link Replacement on page 15-5*. 7. Remove the transmission rear mount bracket. Refer to *Transmission Rear Mount Bracket Replacement on page 16-50*.	
1	Front Stabilizer Shaft Insulator Clamp Bolt (Qty: 4) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 25 N•m (18 lb ft)
2	Front Stabilizer Shaft **Procedure** Transfer components as necessary.

Stabilizer Shaft Link Replacement



3225489

Stabilizer Shaft Link Replacement

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Remove the front tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation on page 15-51*. 3. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*. 4. Remove the front section of the front compartment splash shield. Refer to *Front Compartment Splash Shield Replacement (Front) on page 3-119* or *Front Compartment Splash Shield Replacement (Middle) on page 3-120* or *Front Compartment Splash Shield Replacement (Rear) on page 3-121*.	
1	Front Stabilizer Shaft Link Nut (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*. **Procedure** 1. Fix the rotational pivot bolt with the appropriate tool and remove the upper front stabilizer shaft link nut. 2. Lift the end of the front stabilizer shaft link to allow access to the lower front stabilizer shaft link nut. 3. Fix the rotational pivot bolt with the appropriate tool and remove the lower front stabilizer shaft link nut. **Tighten** 43 N•m (32 lb ft)
2	Front Stabilizer Shaft Link

Front Wheel Bearing and Hub Replacement

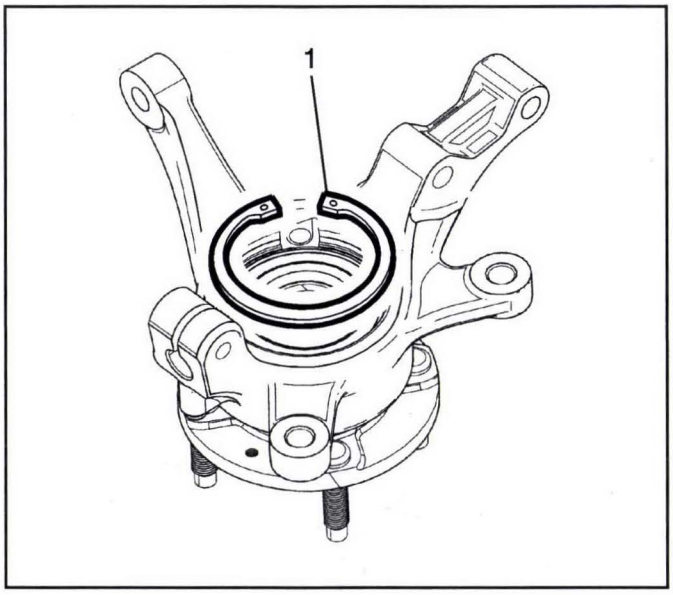
Special Tools

CH-50559 Front Hub/Bearing Remover/Installer Kit

For equivalent regional tools, refer to *Special Tools on page 15-17*.

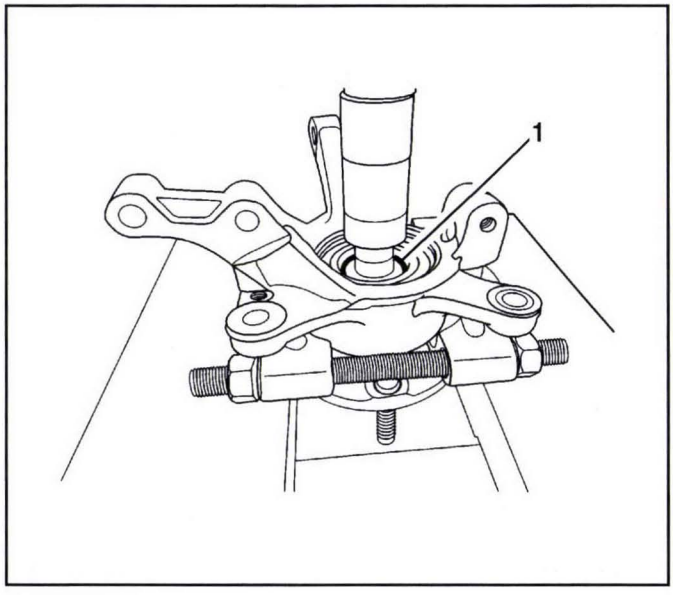
Removal Procedure

1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*.
2. Remove the steering knuckle from the vehicle. Refer to *Steering Knuckle Replacement on page 15-7*.



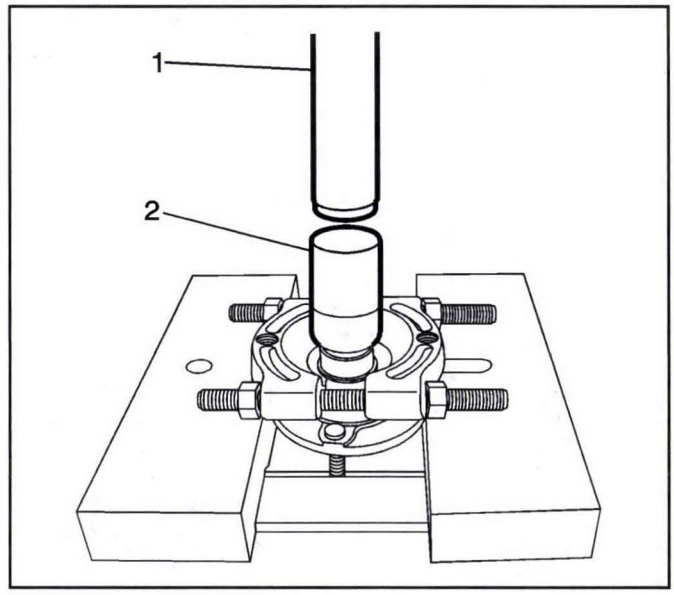
3416614

3. Use an appropriate tool to remove the front wheel bearing retaining ring (1) from the steering knuckle.



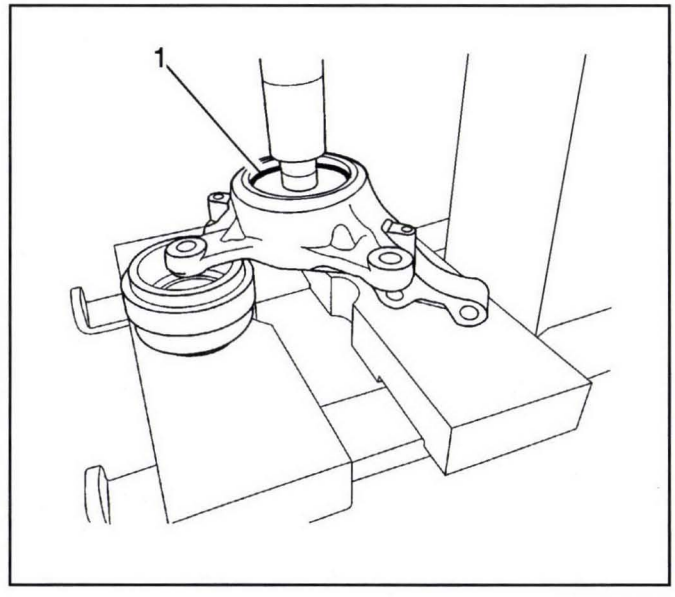
3416616

4. Install a suitable bearing puller between the front wheel bearing and the front wheel bearing hub and position them on a press.
5. Use the *CH-50559–2* remover/installer adapter (1) to separate the front wheel bearing hub from the front wheel bearing.



2549118

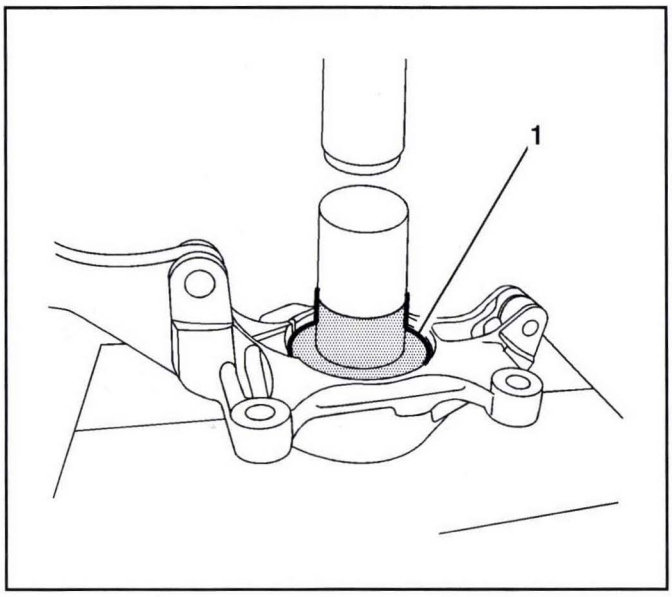
6. If the front wheel bearing inner race is removed with the front wheel bearing hub then use a press (1) and appropriate adapter (2) to remove the race from the hub.



3416618

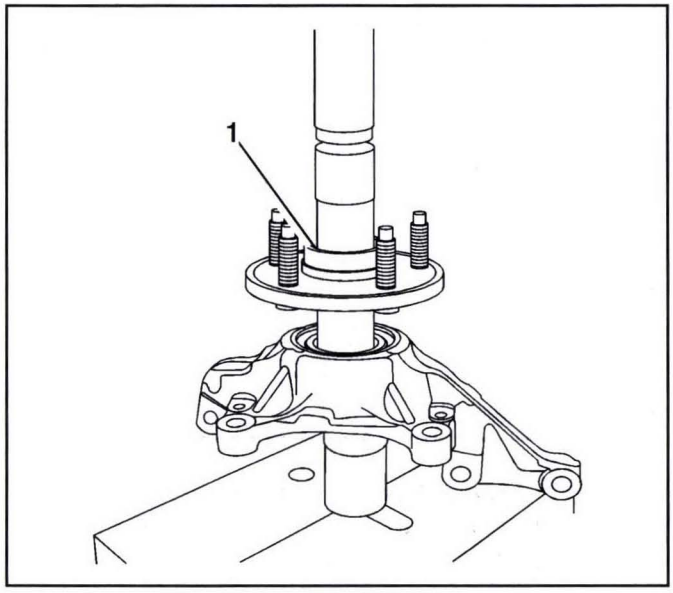
7. Use a suitable spacer and position the steering knuckle assembly horizontally on a press.
8. Use the *CH-50559–3* remover/installer adapter (1) to remove the front wheel bearing from the steering knuckle. Discard the bearing.
9. Inspect the bore of the steering knuckle for pitting, scoring, excessive wear or corrosion. If damage is found and cannot be easily cleaned up with light sanding then replace the steering knuckle.

Installation Procedure



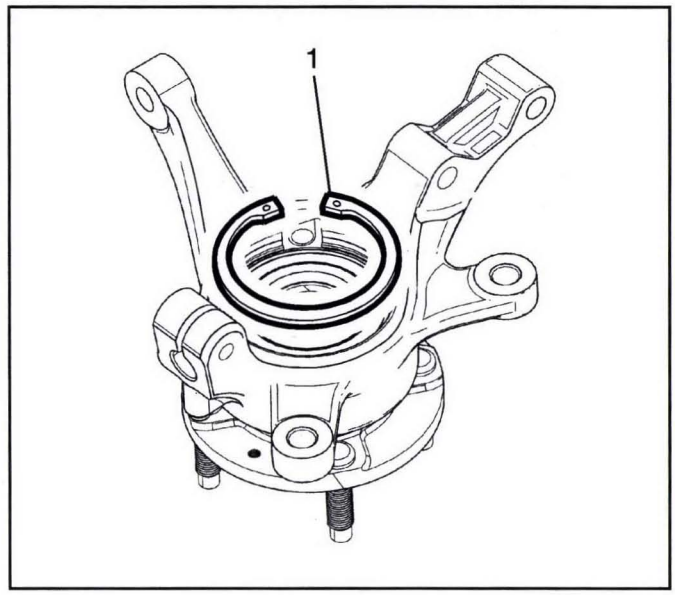
2549120

1. Use the *CH-50559–4* remover/installer adapter (1), appropriate extension and press to install the front wheel bearing into the steering knuckle. Ensure the bearing is seated completely.



2549121

2. Position the *CH-50559–4* remover/installer adapter (1) and appropriate extension to the inside of the front wheel bearing and position the *CH-50559–2* remover/installer adapter and appropriate extension on the front wheel bearing hub.
3. Press the front wheel bearing hub into the front wheel bearing until seated completely.



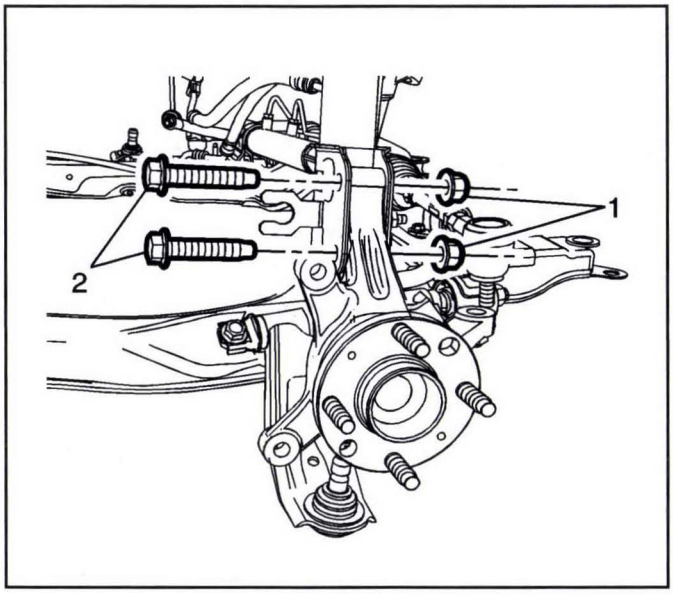
3416614

4. Use an appropriate tool to install the front wheel bearing retaining ring (1) in the steering knuckle.
5. Verify the front wheel bearing hub assembly rotates smoothly.
6. Install the steering knuckle on the vehicle. Refer to *Steering Knuckle Replacement on page 15-7*.

Steering Knuckle Replacement

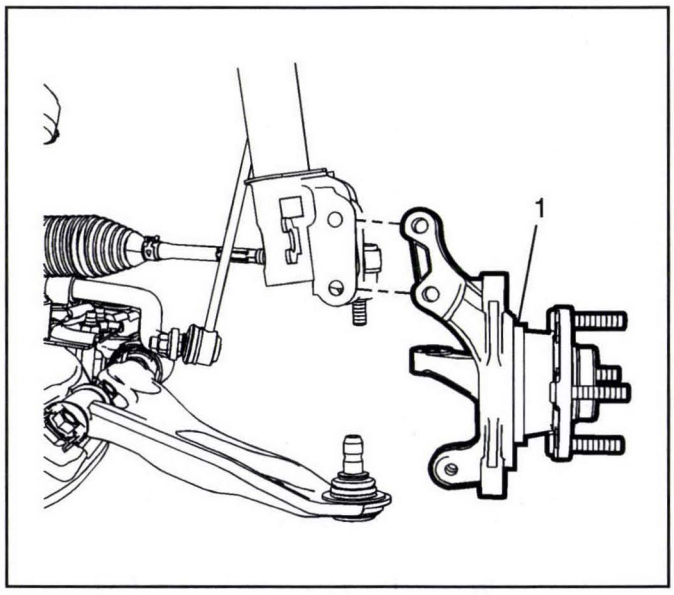
Removal Procedure

1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*.
2. Remove the front tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation on page 15-51*.
3. Disconnect the steering linkage outer tie rod end from the steering knuckle. Refer to *Steering Linkage Outer Tie Rod Replacement on page 14-14*.
4. Remove the front brake shield from the steering knuckle. Refer to *Front Brake Shield Replacement on page 5-125*.
5. Remove the front wheel speed sensor from the steering knuckle. Refer to *Front Wheel Speed Sensor Replacement on page 5-84*.
6. Disconnect the lower control arm from the steering knuckle. Refer to *Lower Control Arm Replacement on page 15-9*.
7. Disconnect the front wheel drive shaft from the steering knuckle. Refer to *Front Wheel Drive Shaft Replacement - Left Side on page 7-4* or *Front Wheel Drive Shaft Replacement - Right Side on page 7-7*.



3137049

8. Remove the front suspension strut nuts (1) and bolts (2).

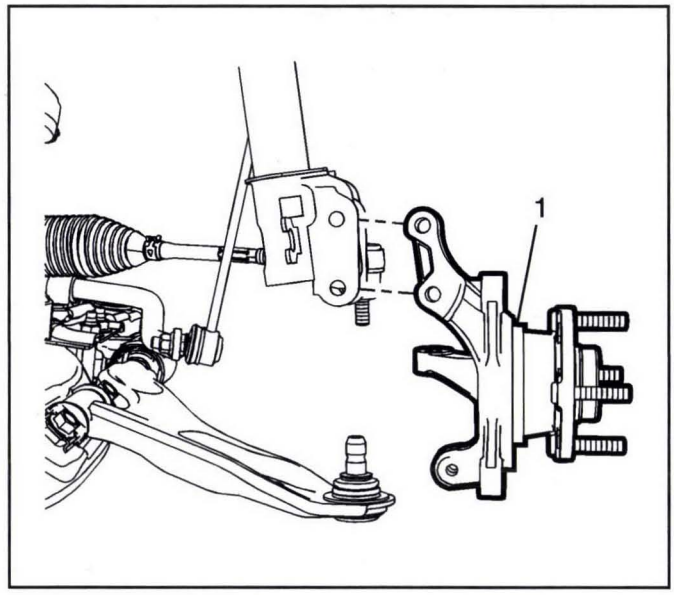


3136898

9. Remove the steering knuckle (1) from the vehicle.
10. Remove the front wheel bearing and hub assembly from the steering knuckle. Refer to *Front Wheel Bearing and Hub Replacement on page 15-5*.

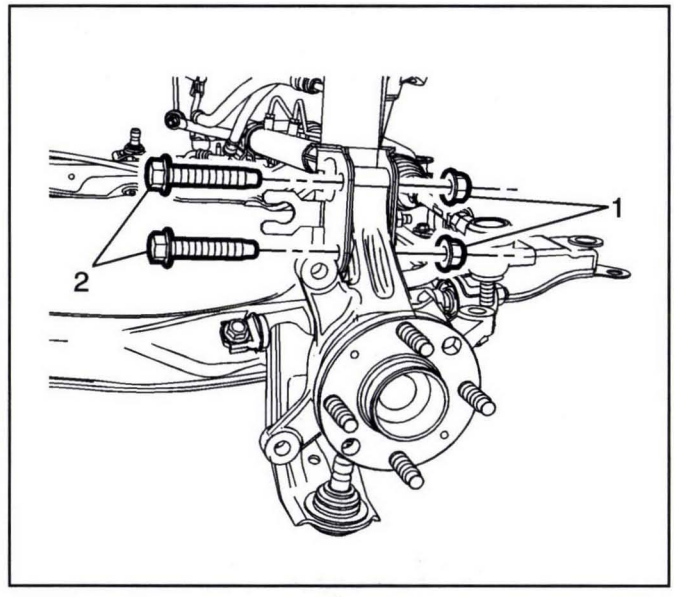
Installation Procedure

1. Install the front wheel bearing and hub assembly in the steering knuckle. Refer to *Front Wheel Bearing and Hub Replacement on page 15-5*.



3136898

2. Position the steering knuckle (1) on the vehicle.



3137049

Caution: Refer to *Fastener Caution on page 0-8*.

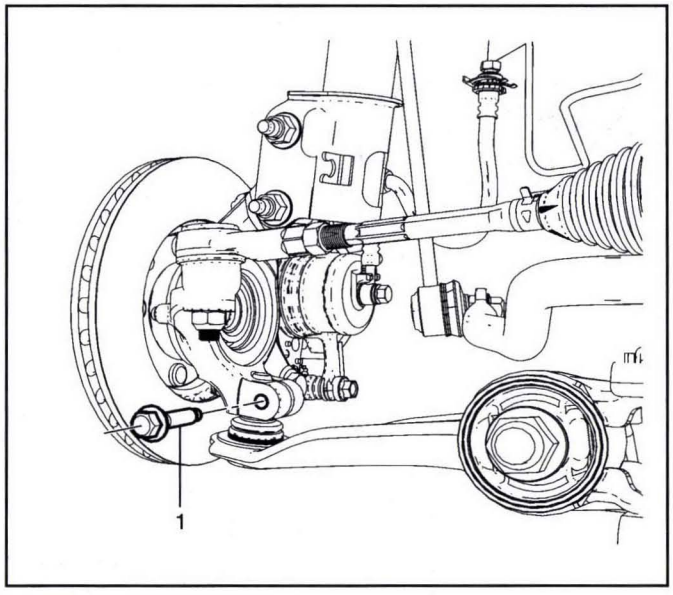
3. Install the front suspension strut bolts (2) and nuts (1).
4. Tighten the front suspension strut nuts (1) to **80** N•m **(59 lb ft) + 30 to 45 degrees**.
5. Connect the front wheel drive shaft to the steering knuckle. Refer to *Front Wheel Drive Shaft Replacement - Left Side on page 7-4* or *Front Wheel Drive Shaft Replacement - Right Side on page 7-7*.
6. Connect the lower control arm to the steering knuckle. Refer to *Lower Control Arm Replacement on page 15-9*.
7. Install the front wheel speed sensor in the steering knuckle. Refer to *Front Wheel Speed Sensor Replacement on page 5-84*.

8. Install the front brake shield on the steering knuckle. Refer to *Front Brake Shield Replacement on page 5-125*.
9. Connect the steering linkage outer tie rod end to the steering knuckle. Refer to *Steering Linkage Outer Tie Rod Replacement on page 14-14*.
10. Install the front tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation on page 15-51*.

Lower Control Arm Replacement

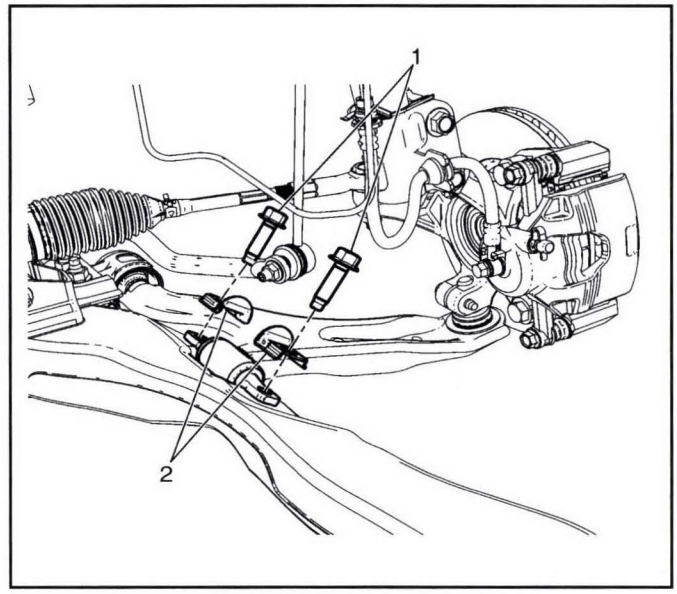
Removal Procedure

1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*.
2. Remove the front tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation on page 15-51*.
3. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
4. Remove the front, middle and rear pieces of the front compartment splash shield. Refer to *Front Compartment Splash Shield Replacement (Front) on page 3-119* or *Front Compartment Splash Shield Replacement (Middle) on page 3-120* or *Front Compartment Splash Shield Replacement (Rear) on page 3-121*.



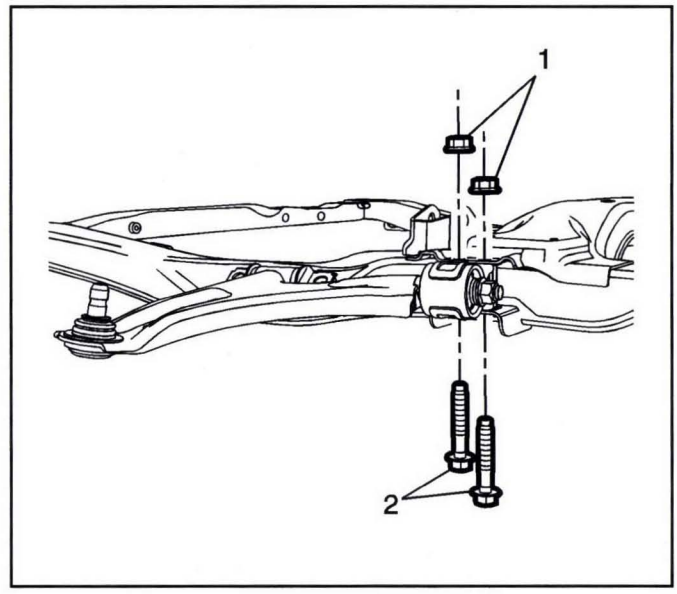
2327521

5. Remove the steering knuckle bolt (1) and disconnect the lower control arm ball joint from the steering knuckle.



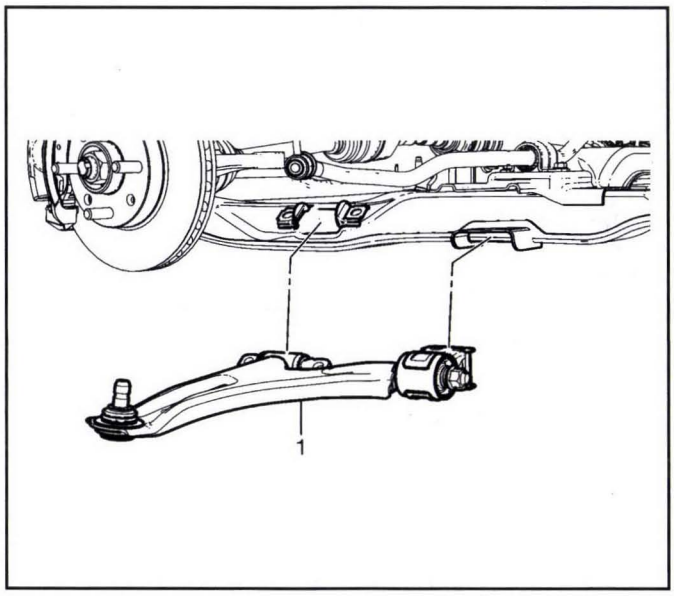
2327518

6. Remove the front lower control arm front bolts (1) and the front lower control arm front bushing brackets (2).



3136954

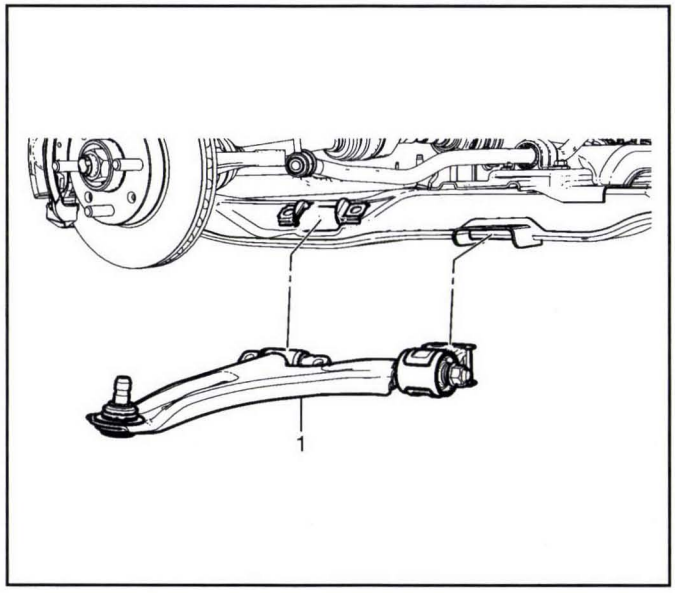
7. Remove the front lower control arm rear nuts (1) and bolts (2).



2327512

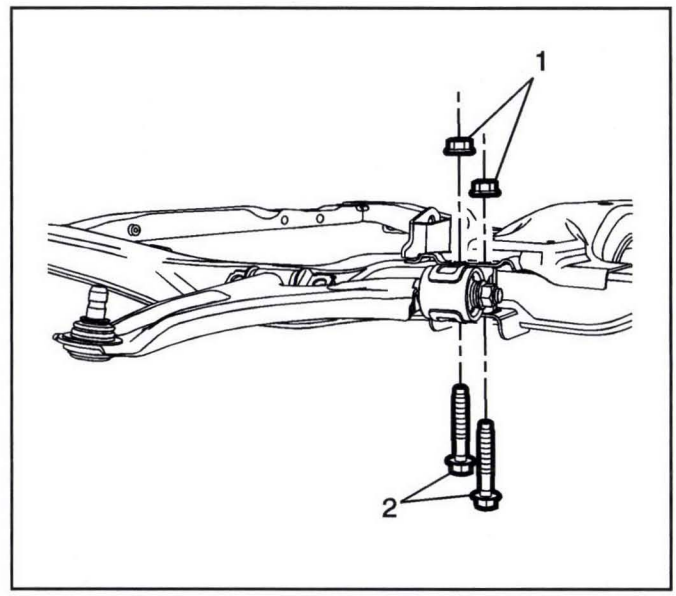
8. Remove the lower control arm (1) from the vehicle.

Installation Procedure



2327512

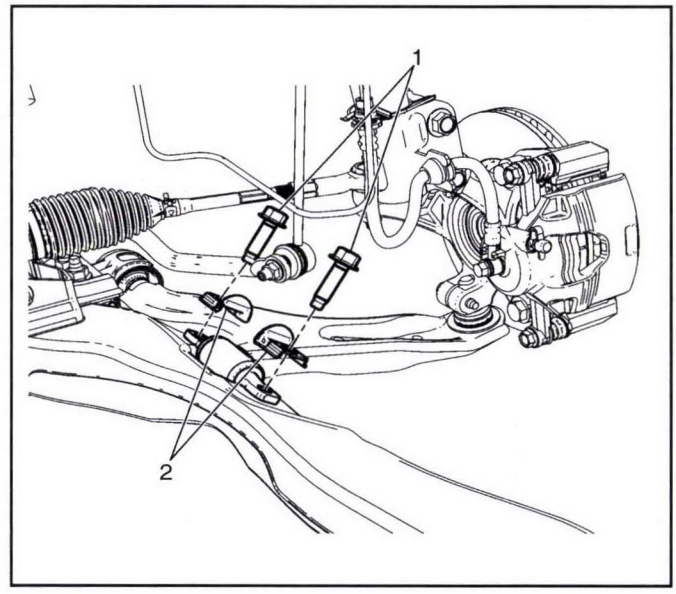
1. Position the lower control arm (1) on the vehicle.



3136954

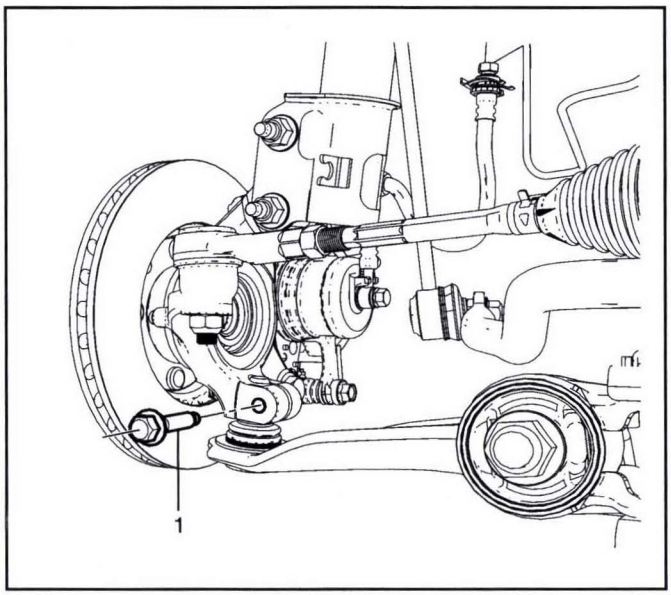
Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the front lower control arm rear bolts (2) and nuts (1) and tighten the bolts to **110** N•m **(81 lb ft)**.



2327518

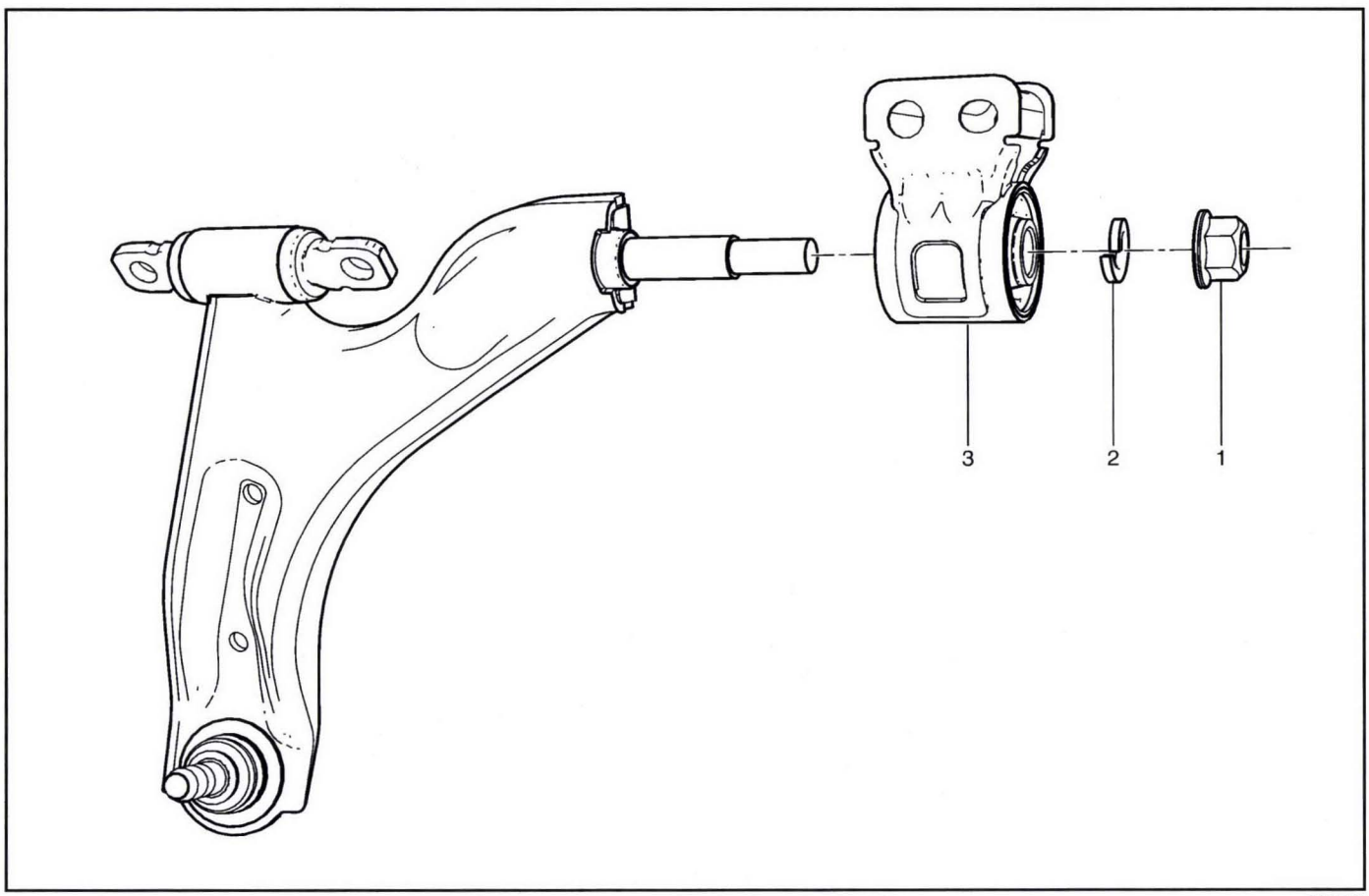
3. Install the front lower control arm front bushing brackets (2) and the front lower control arm front bolts (1) and tighten the bolts to **110** N•m **(81 lb ft)**.



2327521

4. Connect the lower control arm ball joint to the steering knuckle.
5. Install the steering knuckle bolt (1) and tighten to **63** N•m **(46 lb ft)**.
6. Install the front, middle and rear pieces of the front compartment splash shield. Refer to *Front Compartment Splash Shield Replacement (Front) on page 3-119* or *Front Compartment Splash Shield Replacement (Middle) on page 3-120* or *Front Compartment Splash Shield Replacement (Rear) on page 3-121*.
7. Install the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
8. Install the front tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation on page 15-51*.

Front Lower Control Arm Rear Bushing Replacement



2327508

Front Lower Control Arm Rear Bushing Replacement

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Remove the front tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation on page 15-51*. 3. Remove the lower control arm. Refer to *Lower Control Arm Replacement on page 15-9*.	
1	Lower Control Arm Rear Bushing Nut **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 110 N•m (81 lb ft) + 53 degrees
2	Lower Control Arm Rear Bushing Washer
3	Lower Control Arm Rear Bushing **Procedure** 1. Note the position the lower control arm rear bushing is in before removing from the lower control arm bushing nut to prevent later misalignment. 2. Hold the lower control arm rear bushing in the previously noted position while tightening the lower control arm rear bushing nut to prevent misalignment.

Wheel Stud Replacement

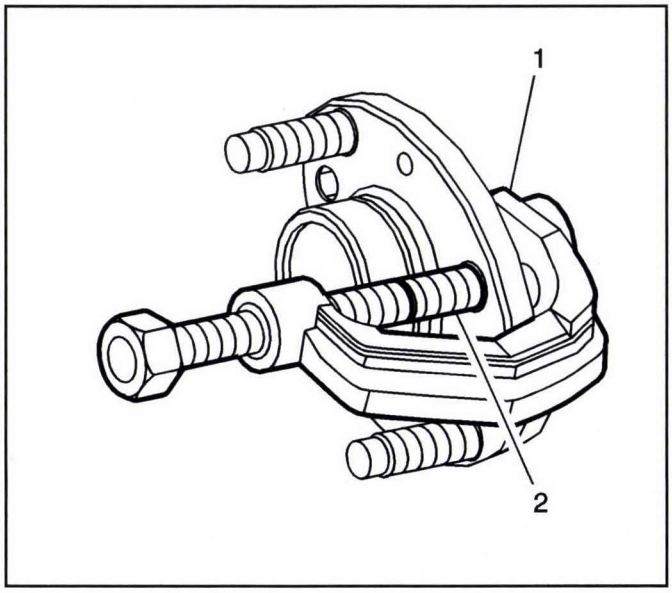
Special Tools

CH-43631 Ball Joint Separator

For equivalent regional tools, refer to *Special Tools on page 15-17*.

Removal Procedure

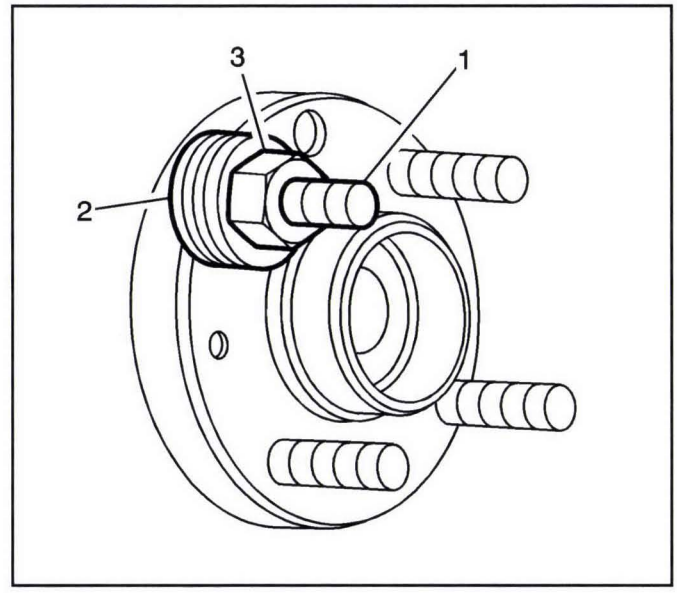
1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*.
2. Remove the front wheel bearing and hub assembly. Refer to *Front Wheel Bearing and Hub Replacement on page 15-5*.



3239370

3. Use the *CH-43631* separator (1) to remove the wheel stud (2) from the front wheel bearing and hub assembly. Discard the stud.

Installation Procedure



3239361

1. Position the NEW wheel stud (1) in the front wheel bearing and hub assembly.
2. Install flat washers (2) and an old wheel nut (3) on the wheel stud (1).
3. Use a suitable tool to prevent the flange on the bearing and hub assembly from turning.
4. Tighten the wheel nut (3) until the wheel stud (1) is firmly seated.
5. Remove the wheel nut (3) and flat washers (2).
6. Install the front wheel bearing and hub assembly. Refer to *Front Wheel Bearing and Hub Replacement on page 15-5*.

Strut Assembly Removal and Installation

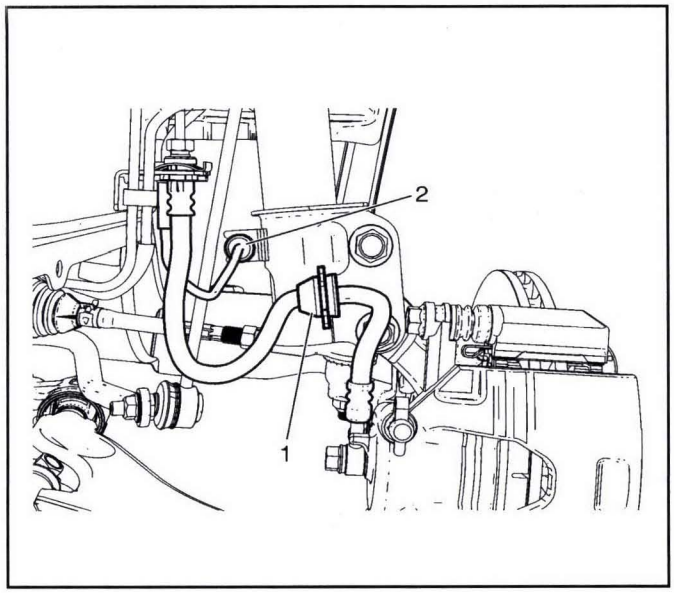
Special Tools

CH-49375 Spanner

For equivalent regional tools, refer to *Special Tools on page 15-17*.

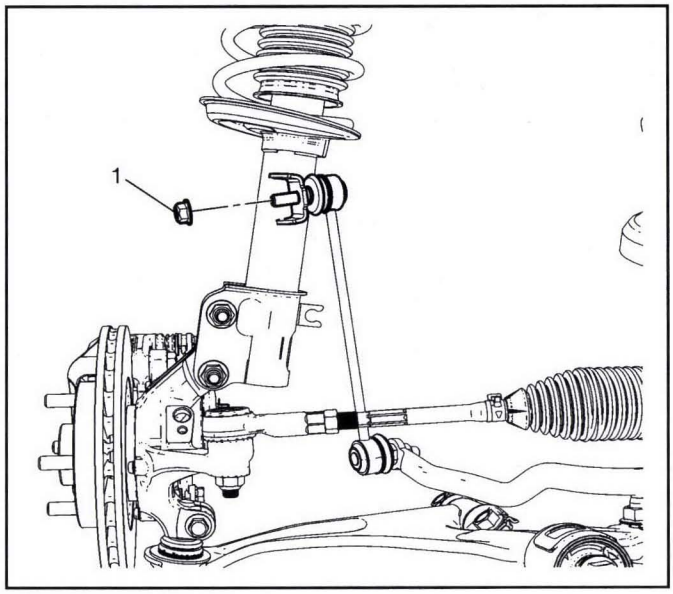
Removal Procedure

1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*.
2. Remove the front tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation on page 15-51*.



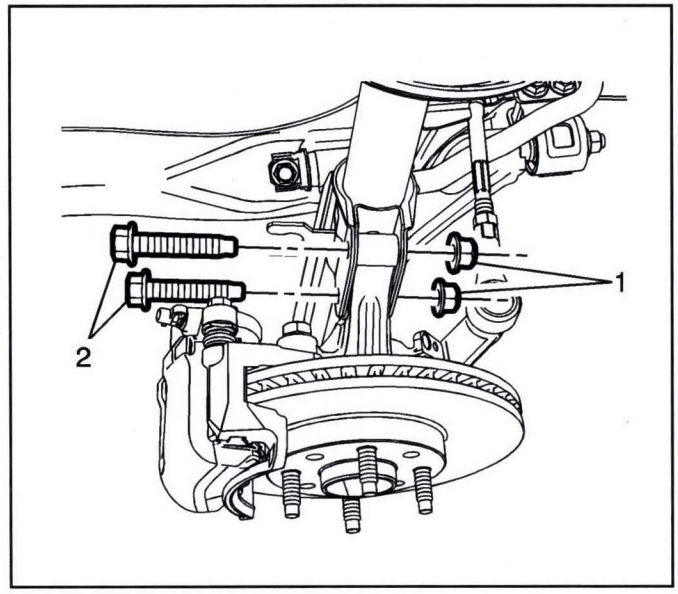
2327495

3. Detach the front brake hose grommet (1) from the strut bracket.
4. Detach the front wheel speed sensor wiring harness grommet (2) from the strut bracket.



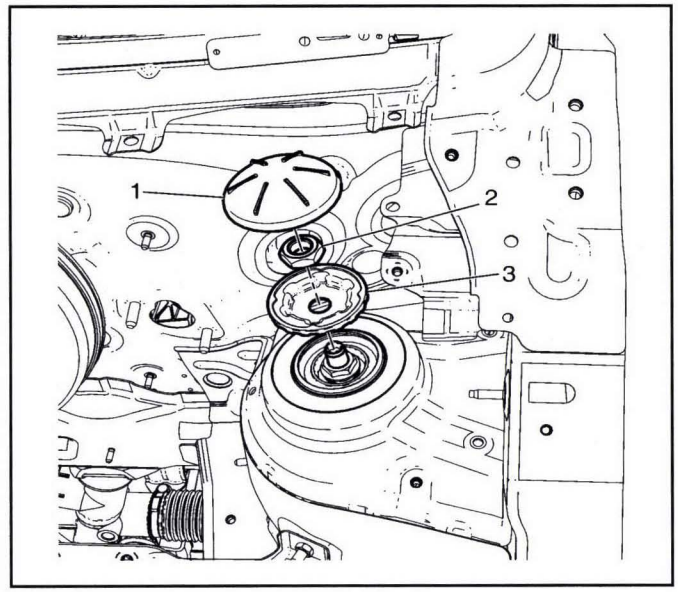
2327493

5. Remove the front stabilizer shaft link nut (1) and disconnect the front stabilizer shaft link from the strut assembly.



3137034

6. Remove the front suspension strut nuts (1) and bolts (2).
7. Remove the plenum front panel. Refer to *Plenum Front Panel Replacement on page 3-38*.



2327487

8. Remove the front suspension strut mount cover (1).

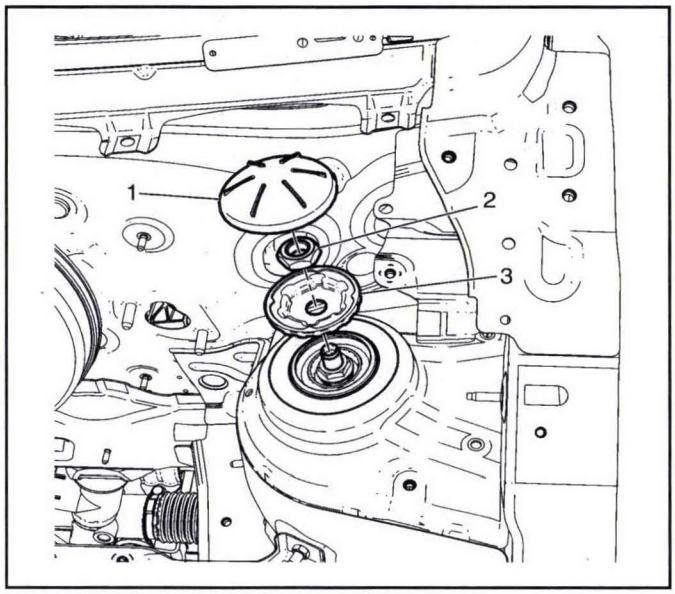
Caution: Completely fix the strut pivot with the special tool not to rotate when removing the strut upper mounting nut. Failure to do this could cause damage to the vehicle or component.

9. Use the *CH-49375* spanner to remove the front suspension strut upper mounting nut (2).
10. Remove the front suspension strut mounting plate (3).

11. Raise the vehicle and disconnect the strut assembly from the steering knuckle.
12. Remove the strut assembly from the vehicle.

Installation Procedure

1. Position the front strut assembly on the vehicle and connect the strut assembly to the steering knuckle.



2327487

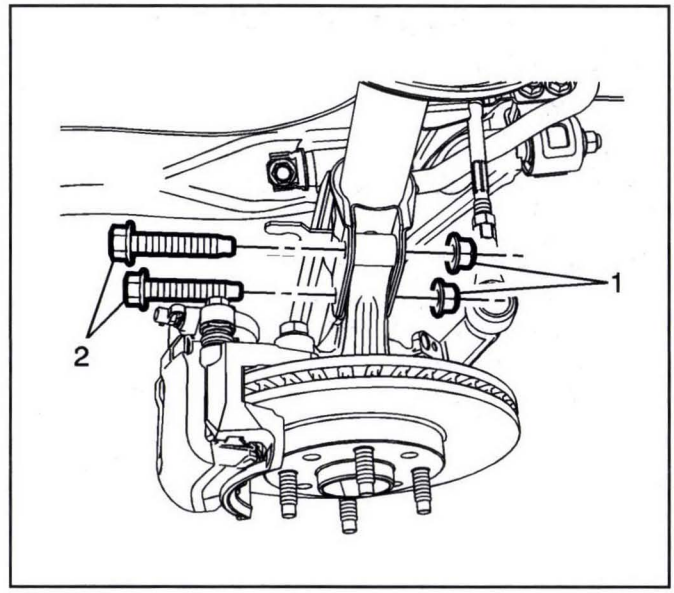
2. Lower the vehicle and install the front suspension strut mounting plate (3).

Caution: Completely fix the strut pivot with the special tool not to rotate when removing the strut upper mounting nut. Failure to do this could cause damage to the vehicle or component.

3. Use the *CH-49375* spanner to install the strut upper mounting nut (2).

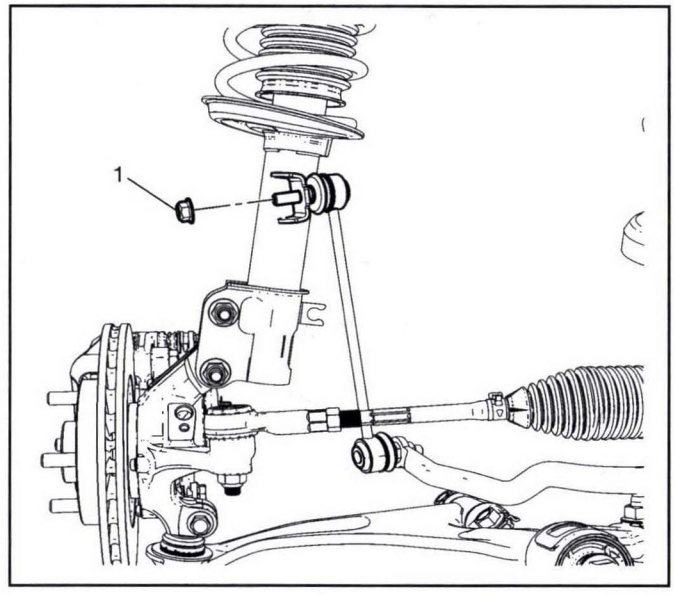
Caution: Refer to *Fastener Caution on page 0-8*.

4. Tighten the front suspension strut upper mounting nut (2) to **65** N•m **(48 lb ft)**.
5. Install the front suspension strut mount cover (1).
6. Install the plenum front panel. Refer to *Plenum Front Panel Replacement on page 3-38*.



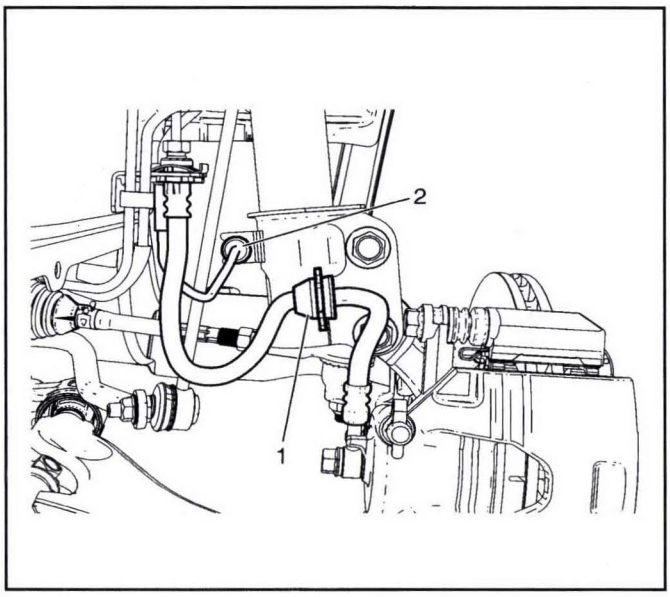
3137034

7. Raise the vehicle and install the front suspension strut bolts (2) and nuts (1).
8. Tighten the front suspension strut nuts (1) to **80** N•m **(59 lb ft) + 30 to 45 degrees**.



2327493

9. Connect the front stabilizer shaft link to the strut assembly and install the front stabilizer shaft link nut (1).
10. Tighten the front stabilizer shaft link nut (1) to **43** N•m **(32 lb ft)**.

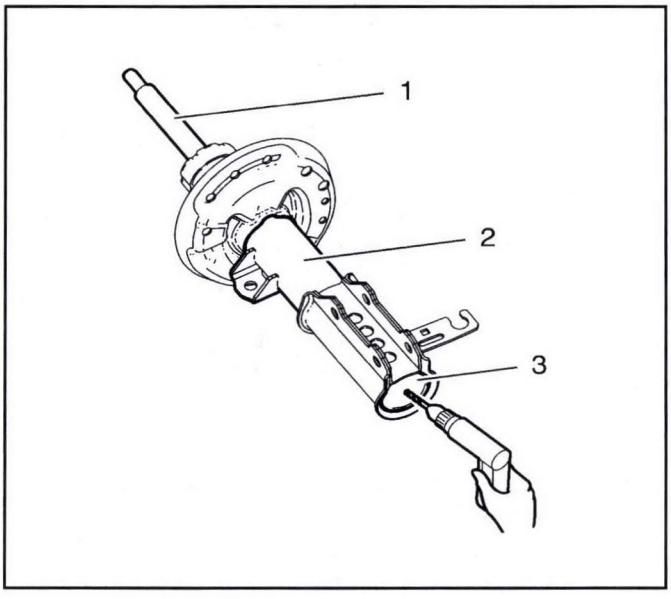


2327495

11. Install the front wheel speed sensor wiring harness grommet (2) in the strut bracket.
12. Install the front brake hose grommet (1) in the strut bracket.
13. Install the front tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation on page 15-51*.
14. After repairs, verify the front wheel alignment and adjust if necessary. Refer to *Wheel Alignment Specifications on page 15-63*.

Suspension Shock/Strut Disposal

Warning: Use the proper eye protection when drilling to prevent metal chips from causing physical injury.



2327484

1. Clamp the strut in a vise horizontally with the rod (1) completely extended.
2. Drill a hole in the strut at the center of the end cap (3) using a 5 mm (3/16 in) drill bit. Gas or a gas/oil mixture will exhaust when the drill bit penetrates the strut. Use shop towels in order to contain the escaping oil.
3. Remove the strut from the vise.
4. Hold the strut over a drain pan vertically with the hole down.
5. Move the rod (1) in and out of the tube (2) to completely drain the oil from the strut.

Strut, Strut Component, or Spring Replacement

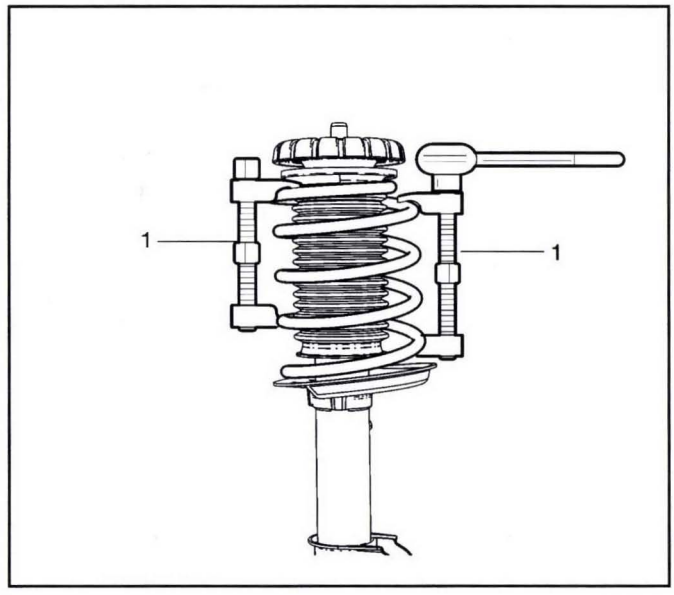
Special Tools

CH-46558 Coil Spring Compressor

For equivalent regional tools, refer to *Special Tools on page 15-17*.

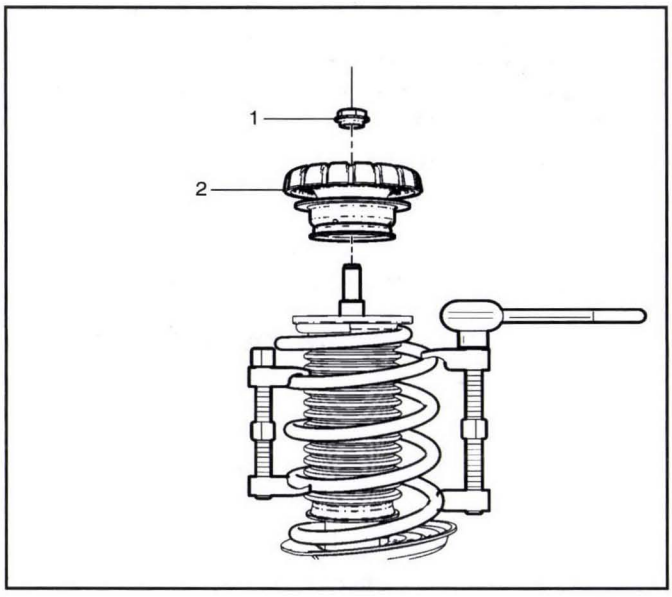
Disassembly Procedure

1. Remove the strut assembly. Refer to *Strut Assembly Removal and Installation on page 15-13*.
2. Position the strut assembly in a suitable holding device.



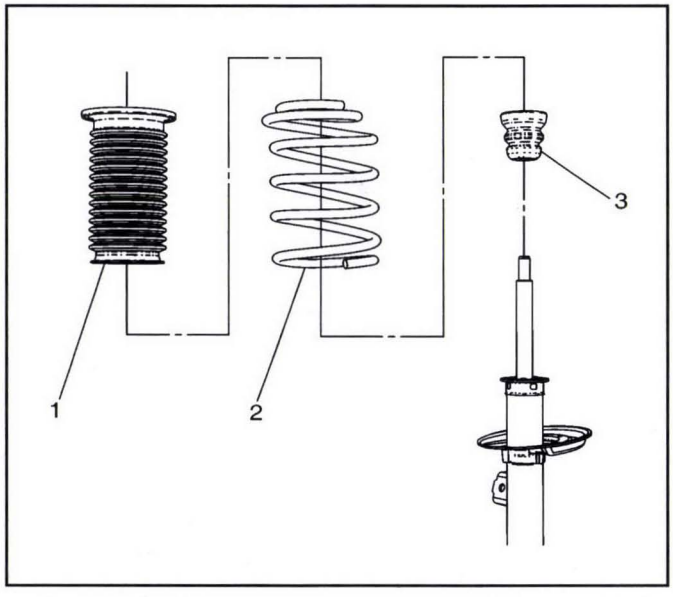
2327481

3. Install the *CH-46558* compressor (1) on the front coil spring and compress the spring.



2327479

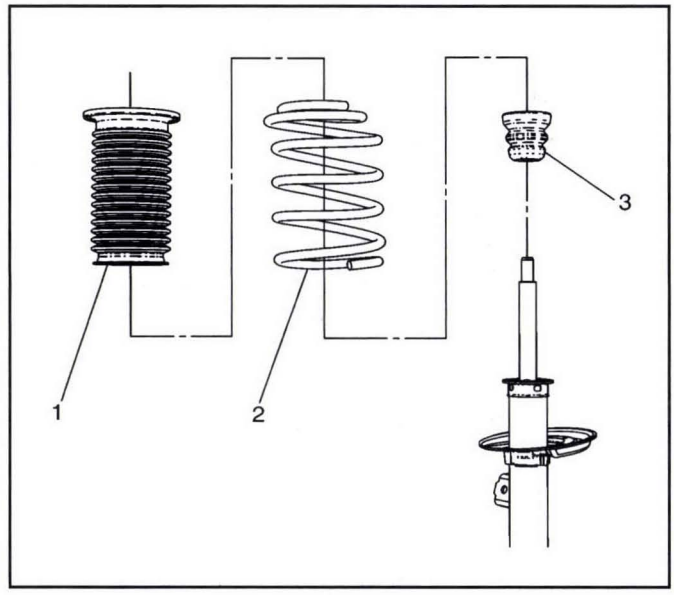
4. Remove the front suspension strut lower mounting nut (1).
5. Remove the front suspension strut mount bearing assembly (2).



2327476

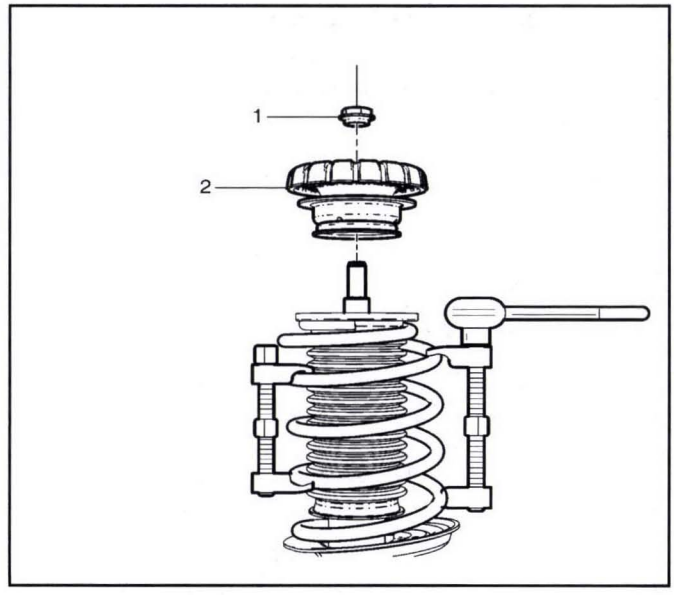
6. Remove the front suspension cartridge upper cover (1).
7. Remove the *CH-46558* compressor from the front coil spring (2) and remove the spring.
8. Remove the front suspension strut bumper (3).
9. Remove the strut from the holding device.

Assembly Procedure



2327476

1. Position the strut in a suitable holding device.
2. Install the front suspension strut bumper (3).
3. Install the front coil spring (2).
4. Install the *CH-46558* compressor on the front coil spring (2) and compress the spring.
5. Install the front suspension cartridge upper cover (1).

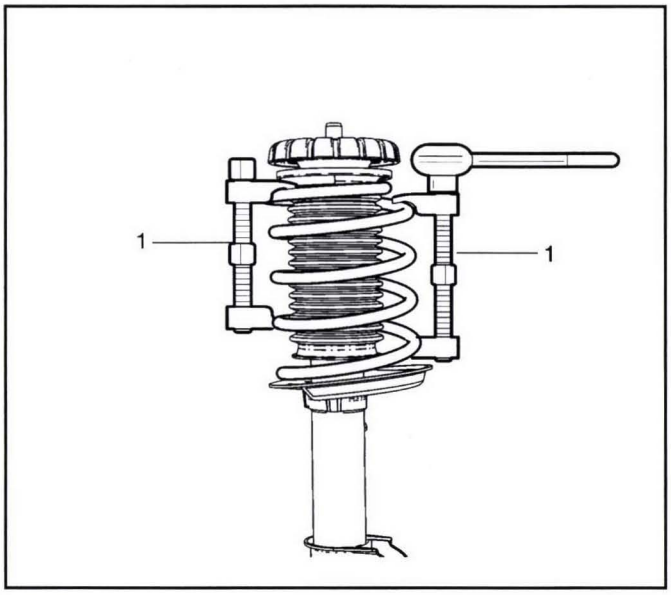


2327479

6. Install the front suspension strut mount bearing assembly (2).

Caution: Refer to *Fastener Caution on page 0-8*.

7. Install the front suspension strut lower mounting nut (1) and tighten to **65 N•m (48 lb ft)**.



2327481

8. Remove the *CH-46558* compressor (1) from the front coil spring.
9. Remove the strut assembly from the holding device.
10. Install the strut assembly. Refer to *Strut Assembly Removal and Installation on page 15-13*.

Description and Operation

Front Suspension Description and Operation

The front suspension has 2 primary purposes:

- Isolate the driver from irregularities in the road surface.
- Define the ride and handling characteristics of the vehicle.

The front suspension absorbs the impact of the tires traveling over irregular road surfaces and dissipates this energy throughout the suspension system. This process isolates the vehicle occupants from the road surface. The rate at which the suspension dissipates the energy and the amount of energy that is absorbed is how the suspension defines the vehicles ride characteristics.

Ride characteristics are designed into the suspension system and are not adjustable. The ride characteristics are mentioned in this description in order to aid in the understanding of the functions of the suspension system. The suspension system must allow for the vertical movement of the tire and wheel assembly as the vehicle travels over irregular road surfaces while maintaining the tire's horizontal relationship to the road.

This requires that the steering knuckle be suspended between a lower control arm and a strut assembly. The lower control arm attaches from the steering knuckle at the outermost point of the control arm. The attachment is through a ball and socket type joint. The innermost end of the control arm attached at 2 points to the vehicle frame through semi-rigid bushings. The upper portion of the steering knuckle is attached to a strut assembly. The strut assembly then connects to the vehicle body by way of an upper bearing. The steering knuckle is allowed to travel up and down independent of the vehicle body structure and frame.

This up and down motion of the steering knuckle as the vehicle travels over bumps is absorbed predominantly by the coil spring. This spring is retained under tension over the strut assembly. A strut is used in conjunction with this system in order to dampen out the oscillations of the coil spring. A strut is a basic hydraulic cylinder.

The strut is filled with oil and has a moveable shaft that connects to a piston inside the strut. Valves inside the shock absorber offer resistance to oil flow and consequently inhibit rapid movement of the piston and shaft. Each end of the shock absorber is connected in such a fashion to utilize this recoil action of a spring alone. Each end of the strut is designed as the connection point of the suspension system to the vehicle and acts as the coil spring seat. This allows the strut to utilize the dampening action to reduce the recoil of a spring alone. The lower control arm is allowed to pivot at the vehicle frame in a vertical fashion. The ball joint allows the steering knuckle to maintain the perpendicular relationship to the road surface.

Front suspensions systems utilize a stabilizer shaft. The stabilizer bar connects between the left and right lower control arm assemblies through the stabilizer link and stabilizer shaft insulators. This bar controls the amount of independent movement of the suspension when the vehicle turns. Limiting the independent movement defines the vehicles handling characteristics on turns.

Special Tools and Equipment

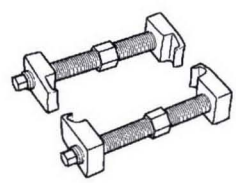
Illustration	Tool Number/ Description
 2329958	CH-43631 CH-49455 J-43631 Ball Joint Separator
 2356177	CH-46558 DW09940-71430 Coil Spring Compressor

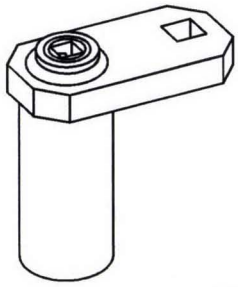
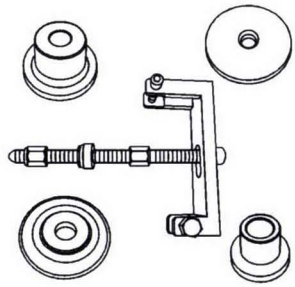
Illustration	Tool Number/ Description
 2330185	CH-49375 Spanner

Illustration	Tool Number/ Description
 2548684	CH-50559 Front Hub/Bearing Remover/Installer Kit

Rear Suspension

Specifications

Fastener Tightening Specifications

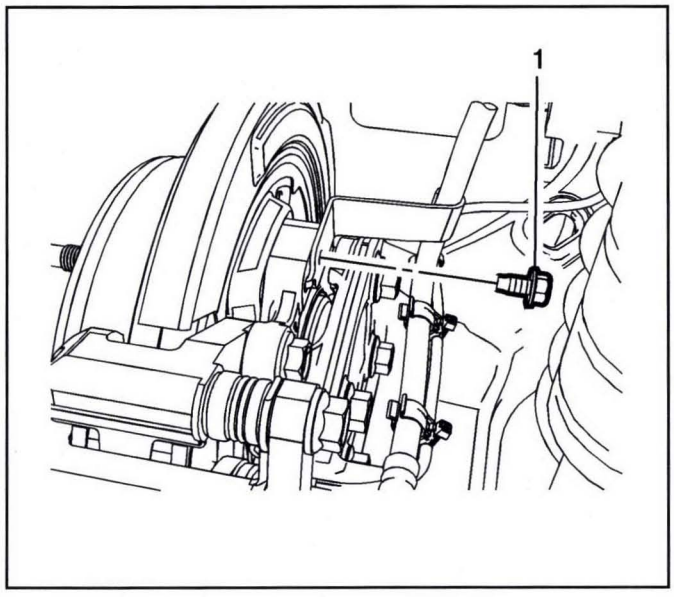
Application	Specification	
	Metric	English
Rear Suspension Trailing Arm Bolts	165 N•m	122 lb ft
Rear Wheel Bearing and Hub Bolts	58 N•m	43 lb ft
Shock Absorber Lower Bolt (1)		
First Pass	150 N•m	111 lb ft
Final Pass	plus 65 to 75 degrees	
Shock Absorber Nut at Upper Mount	25 N•m	18 lb ft
Shock Absorber Upper Bolts	100 N•m	74 lb ft

Repair Instructions

Rear Wheel Bearing and Hub Replacement

Removal Procedure

1. Raise and suitably support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*.
2. Remove the tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation on page 15-51*.

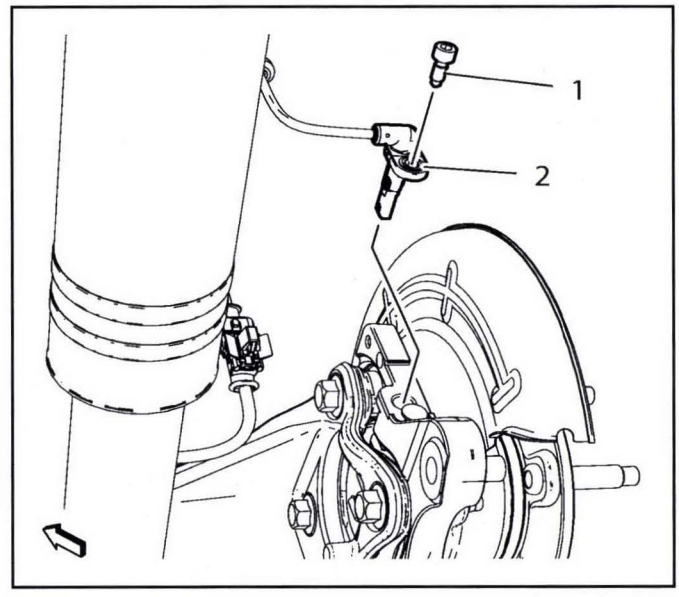


3227991

3. Remove the brake hose bracket bolt (1). Refer to *Rear Brake Hose Replacement on page 5-209*.

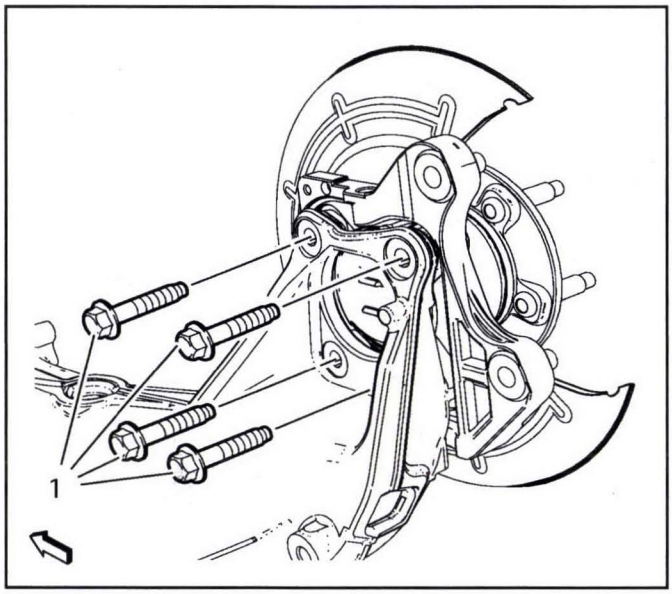
Caution: Support the brake caliper with heavy mechanic wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may cause damage to the brake hose and in turn may cause a brake fluid leak.

4. Without disconnecting the hydraulic brake flex hose, remove and support the rear brake caliper and bracket as an assembly. Refer to *Rear Brake Caliper Bracket Replacement on page 5-119*.
5. . Remove the rear brake rotor. Refer to *Rear Brake Rotor Replacement on page 5-124*



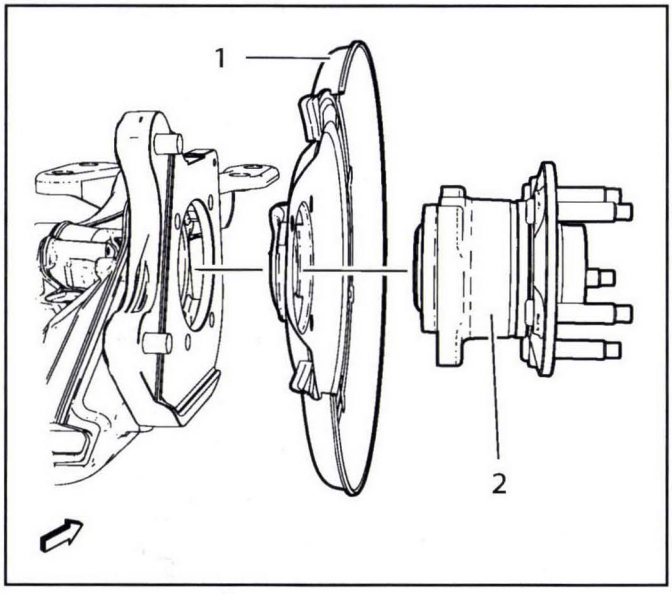
2027694

6. Remove the wheel speed sensor bolt (1).
7. Remove the wheel speed sensor (2).



2027695

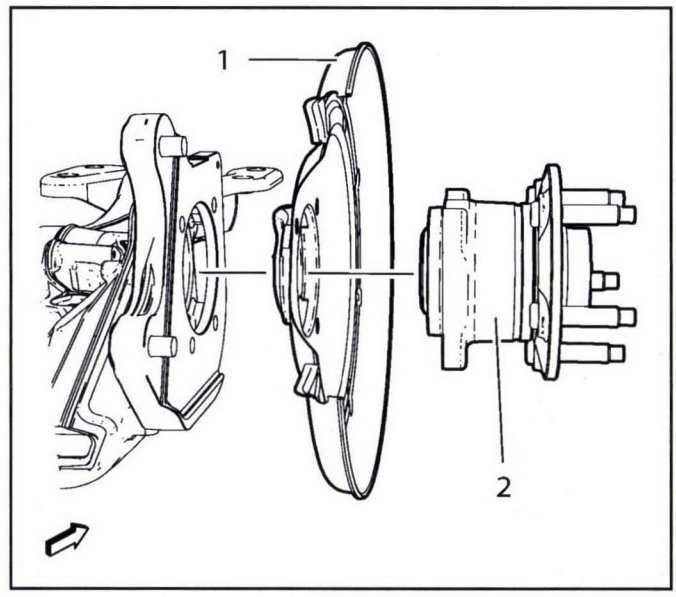
8. Remove the 4 wheel bearing/hub mounting bolts (1).



2027698

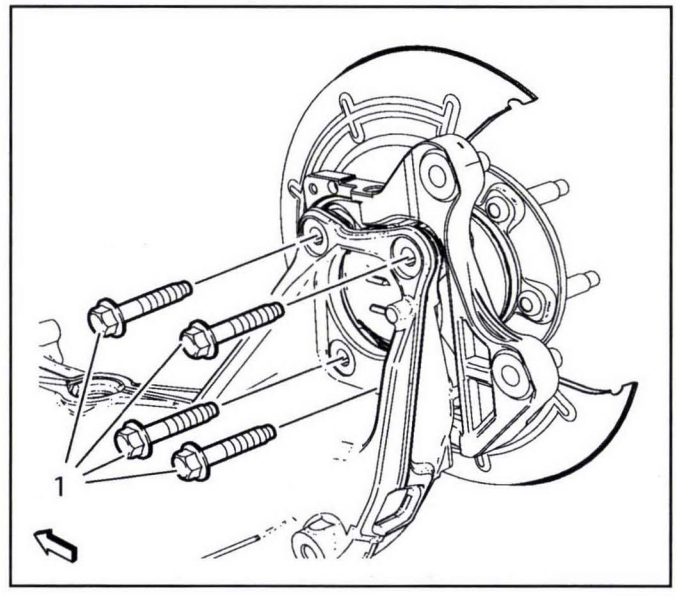
9. Remove the wheel bearing/hub assembly (2) and rear brake shield (1) from the rear axle.

Installation Procedure



2027698

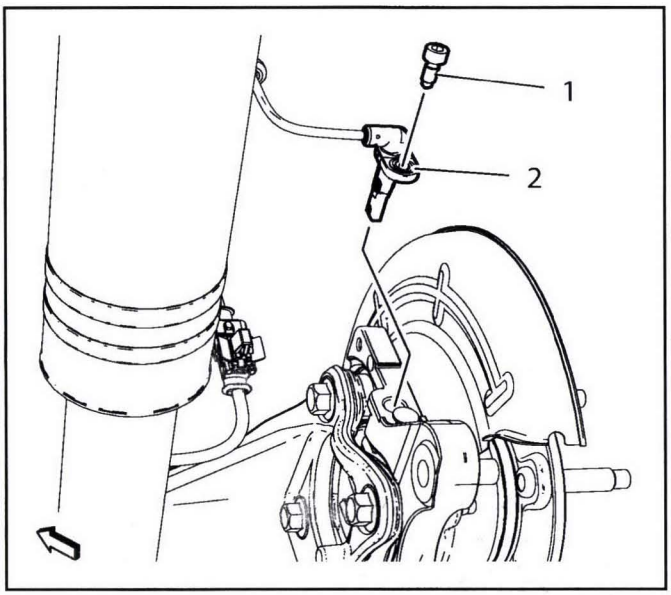
1. Position the rear brake shield (1) and wheel bearing/hub assembly (2) in the rear axle.



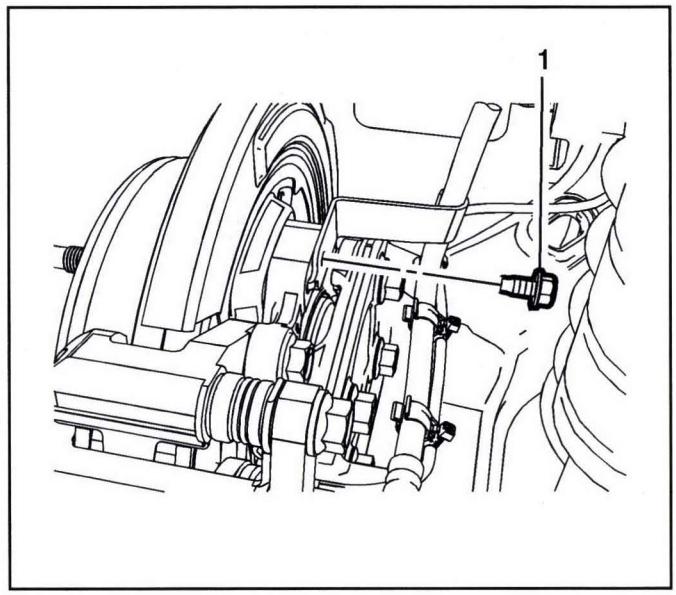
2027695

Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the 4 wheel bearing/hub mounting bolts (1) and tighten to **58 N•m (43 lb ft)**.



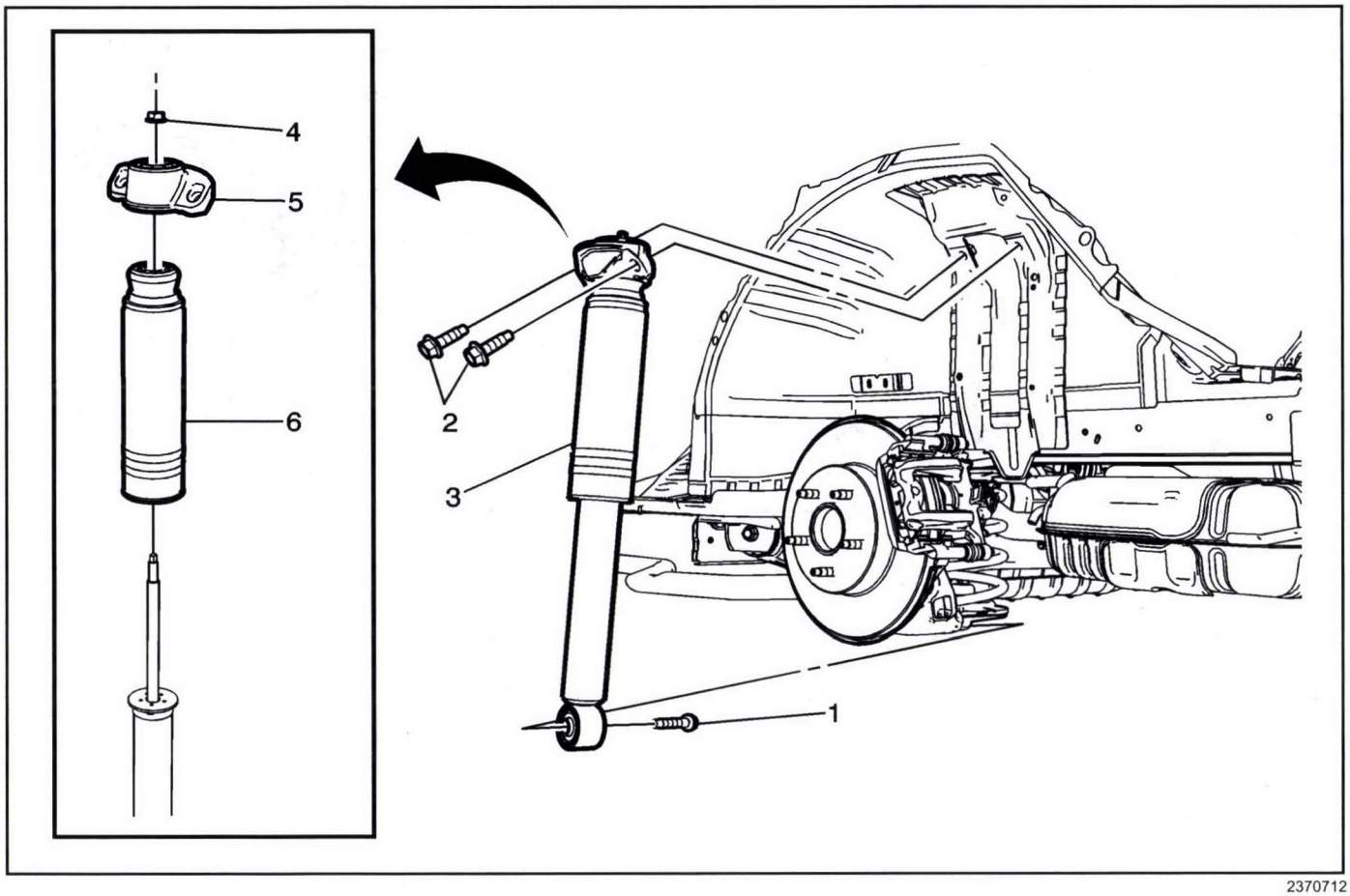
2027694



3227991

3. Install the wheel speed sensor (2).
4. Install the wheel speed sensor bolt (1) Refer to *Rear Wheel Speed Sensor Replacement on page 5-86*.
5. Install the brake rotor. Refer to *Rear Brake Rotor Replacement on page 5-124*.
6. Install the brake caliper and bracket as an assembly. Refer to *Rear Brake Caliper Bracket Replacement on page 5-119*.
7. Install the brake hose bracket bolt (1). Refer to *Rear Brake Hose Replacement on page 5-209*.
8. Install the tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation on page 15-51*.
9. Lower the vehicle.

Shock Absorber Replacement



2370712

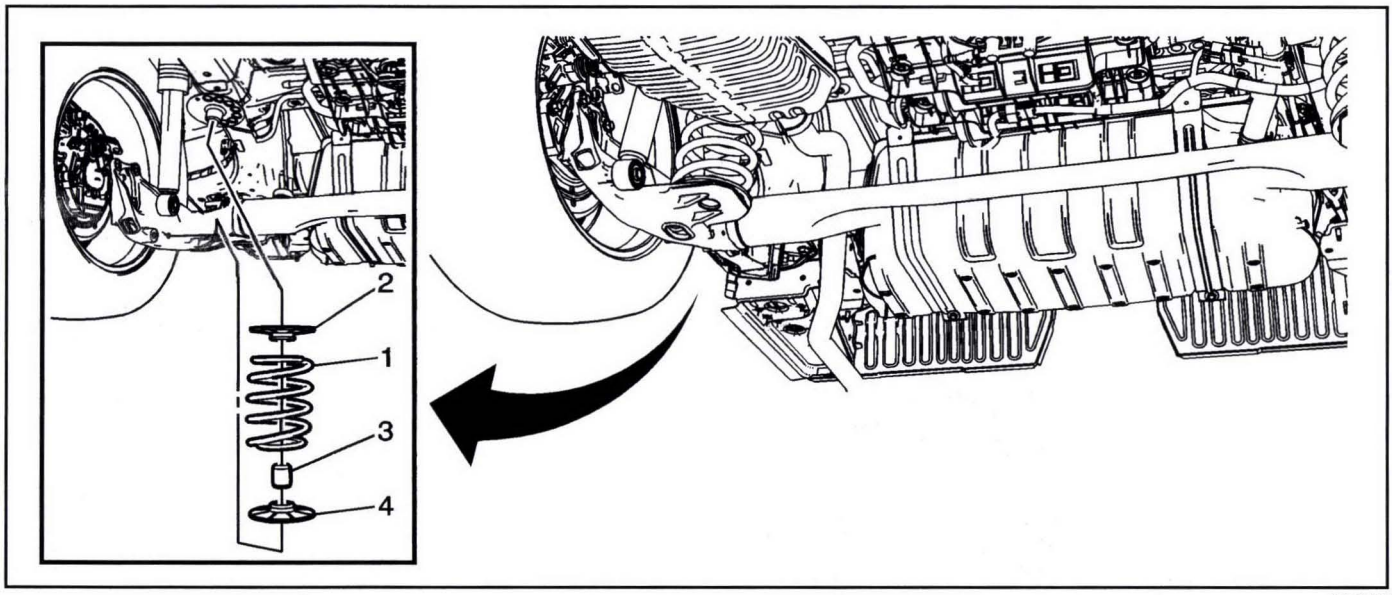
Shock Absorber Replacement

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Remove the tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation on page 15-51*.	
1	Rear Shock Absorber Bolt. ***Warning: Refer to Torque-to-Yield Fastener Warning on page 0-7.*** **Caution:** Refer to *Fastener Caution on page 0-8*. **Procedure** 1. Support the rear axle with a suitable jack stand. 2. Remove and DISCARD the bolt. DO NOT re-use, replace with NEW only. 3. Support the rear end of the rear axle with a suitable jack stand and raise the rear axle to the proper D Height. Refer to *Trim Height Inspection on page 15-35*. 4. Tighten the rear shock absorber lower bolt.. **Tighten** 1. First Pass: 150 N•m (111 lb ft) 2. Final Pass: additional 65 to 75 degrees.
2	Rear Shock Absorber Bolt (Qty:2) **Tighten** 100 N•m (74 lb ft)
3	Rear Shock Absorber

Shock Absorber Replacement (cont'd)

Callout	Component Name
4	Rear Shock Absorber Nut **Procedure** 1. Using the *CH-51095* wrench or equivalent, remove and install rear shock absorber nut. **Tighten** 25 N•m (18 lb ft) **Special Tools** *CH-51095* Shock Absorber Strut Wrench for equivalent regional tools, Refer to *Special Tools on page 15-27*.
5	Rear Shock Absorber Upper Mount
6	Rear Shock Absorber Upper Bumper

Rear Coil Spring Replacement



2370716

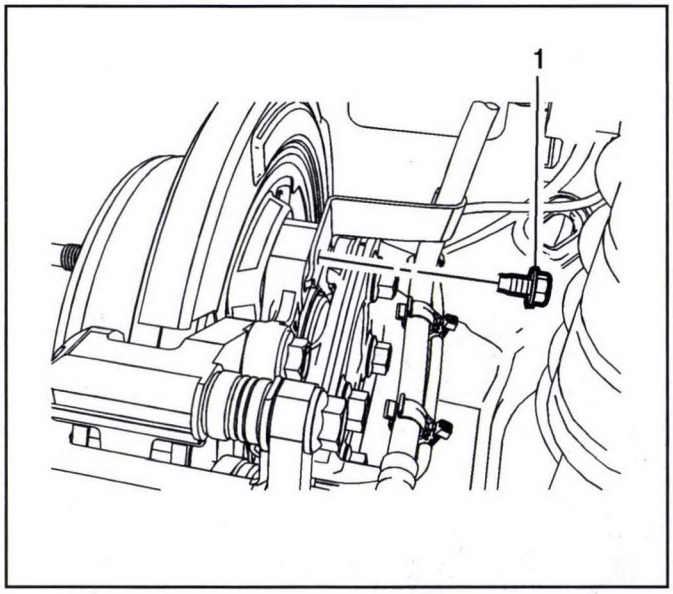
Rear Coil Spring Replacement

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*	
1	Rear Suspension Spring **Procedure** 1. Support the rear axle with a suitable jack stand. 2. If the springs are being removed to service or to service other suspension components and the tags are missing, mark the relationship of the rear spring prior to removal for the proper installation. 3. Remove the left and right lower shock absorber bolts. Refer to *Shock Absorber Replacement on page 15-22*. 4. Using the jack stand, slowly lower the rear axle in order to remove tension from the rear springs. **Note:** The rear springs are indexed with color are tags toward the rear of the vehicle and towards the top of the spring.
2	Rear Suspension Spring Insulator
3	Rear Suspension Stop
4	Rear Suspension Spring Insulator

Rear Axle Replacement

Removal Procedure

1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*.
2. Remove the tires and wheels. Refer to *Tire and Wheel Removal and Installation on page 15-51*.

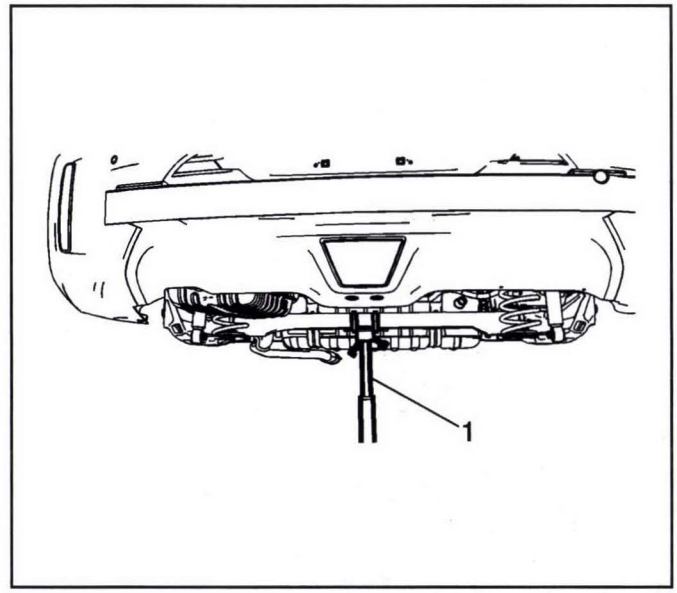


3227991

3. Remove the brake hose bracket bolts (1) attaching the brake hose brackets to the rear brake calipers. Refer to *Rear Brake Hose Replacement on page 5-209*.

Caution: Support the brake caliper with heavy mechanic wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may cause damage to the brake hose and in turn may cause a brake fluid leak.

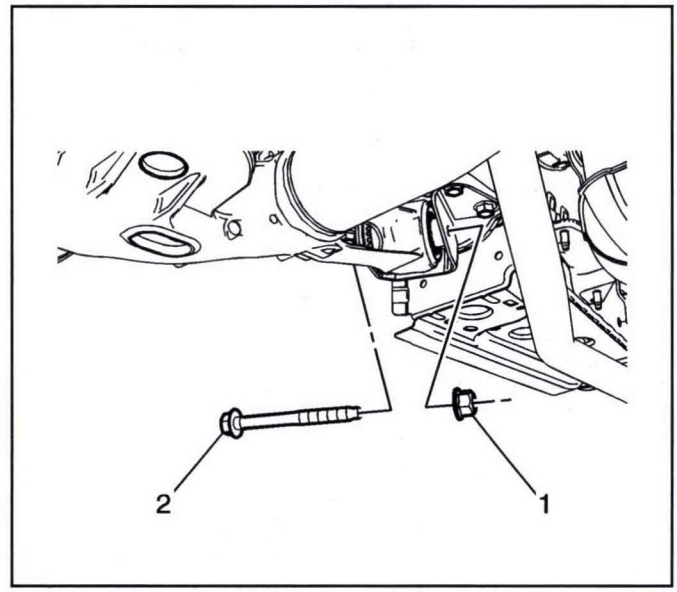
4. Without disconnecting the hydraulic brake flex hose, remove and support the rear brake caliper and bracket as an assembly and remove the rear brake rotor. Refer to *Rear Brake Rotor Replacement on page 5-124*.
5. Remove the wheel speed sensor from the rear parking brake anchor. Refer to *Rear Wheel Speed Sensor Replacement on page 5-86*
6. Remove the right and left rear wheel bearing/hub and backing plate assemblies. Refer to *Rear Wheel Bearing and Hub Replacement on page 15-19*.
7. Remove the shock absorber lower bolts. Refer to *Shock Absorber Replacement on page 15-22*.



2547328

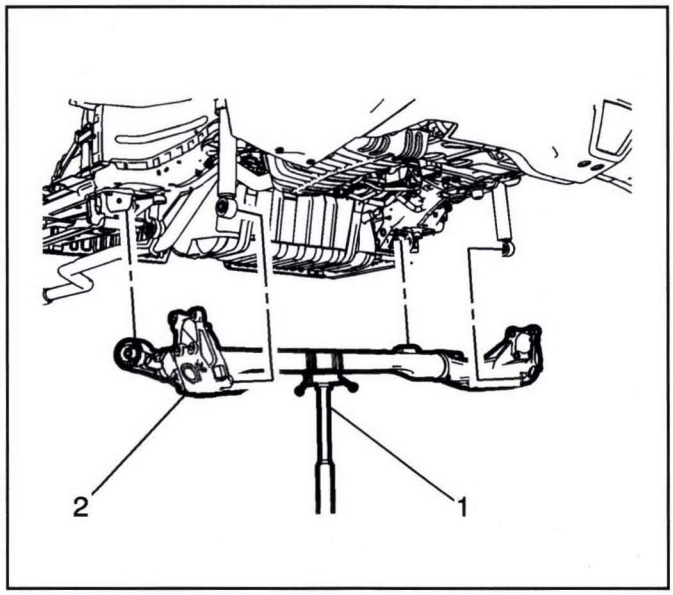
8. Secure the rear axle assembly to the hydraulic transmission jack (1).

   Note: Replace the rear spring insulators or the rear suspension jounce bumper if they are found to be damaged.
9. Remove the rear springs and the insulators. Refer to *Rear Coil Spring Replacement on page 15-23*.



2371375

10. Remove the rear axle bushing nuts (1) and bolts (2).

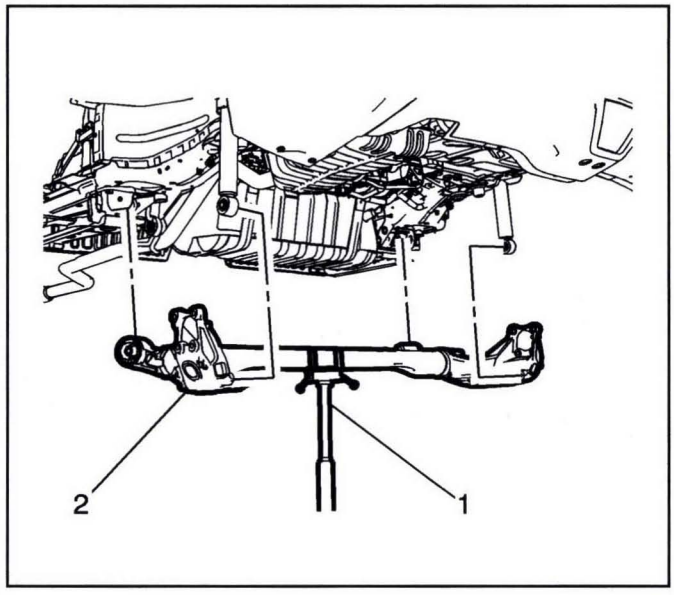


2547342

Note: It maybe necessary to have an assistant to help remove the rear axle from the vehicle.

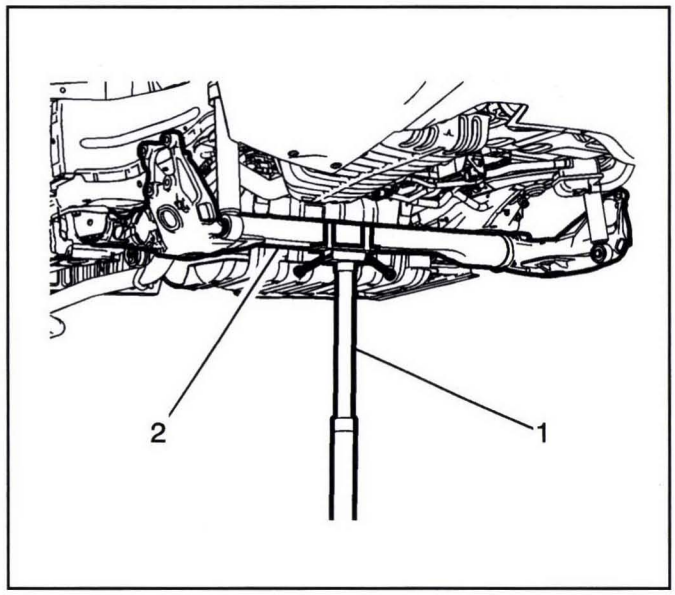
11. Using the hydraulic transmission jack (1), remove the rear axle (2) from the vehicle.
12. With the aid of an assistant, remove the rear axle assembly from the hydraulic transmission jack.

Installation Procedure



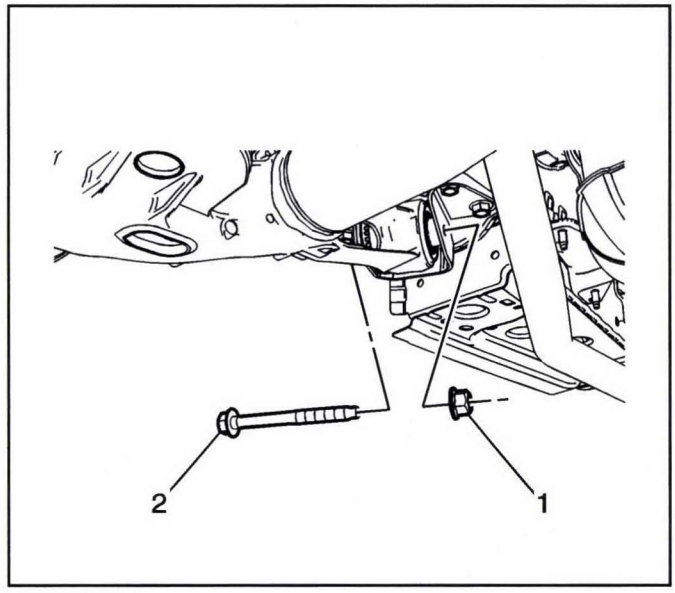
2547342

1. With the aide of an assistant, position the rear axle assembly (2) on the hydraulic transmission jack (1).



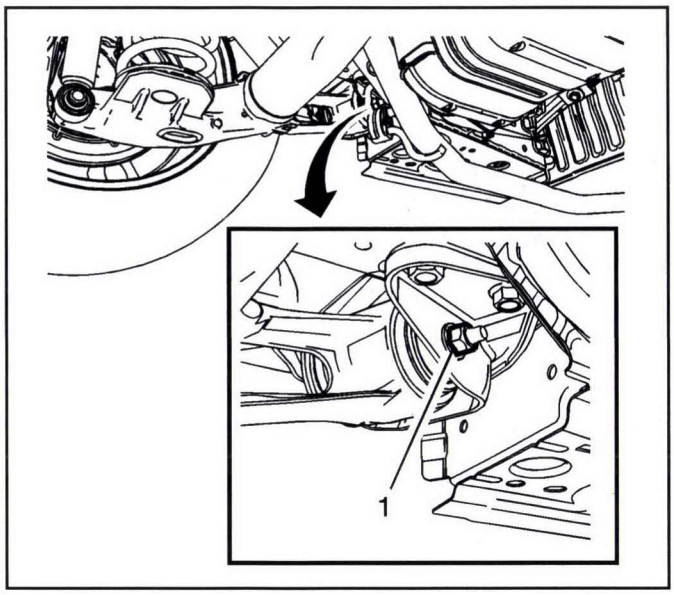
2547357

2. Using the hydraulic transmission jack (1) and the aid of an assistant, raise the rear axle (2) into the rear axle brackets.



2371375

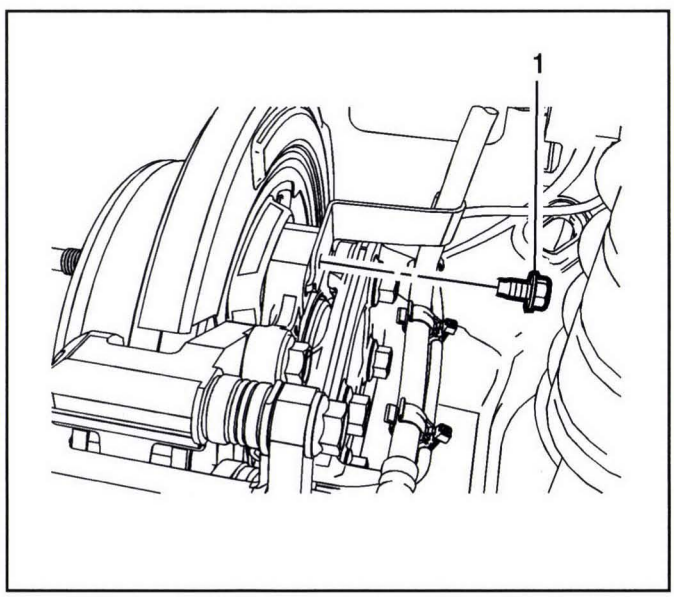
3. Install the rear axle bushing nuts (1) and the bolts (2) and hand tighten.
4. Install the rear springs and insulators. Refer to *Rear Coil Spring Replacement on page 15-23*.
5. Using the hydraulic transmission jack, raise the rear axle to correct trim height. Refer to *Trim Height Inspection on page 15-35*.



2547212

Caution: Refer to *Fastener Caution on page 0-8*.

6. Tighten the trailing arm bolts (2) to **165** N•m **(122 lb ft)**.
7. Install the shock absorber lower bolts. Refer to *Shock Absorber Replacement on page 15-22*.
8. Install the rear wheel bearings/hub and backing plate assemblies. Refer to *Rear Wheel Bearing and Hub Replacement on page 15-19*.
9. Install the wheel speed sensors. Refer to *Rear Wheel Speed Sensor Replacement on page 5-86*.
10. Install the brake rotor, and install the brake caliper and bracket as an assembly. Refer to *Rear Brake Rotor Replacement on page 5-124*.



3227991

11. Install the brake hose bracket bolts (1) attaching the brake hose brackets to the rear brake calipers. Refer to *Rear Brake Hose Replacement on page 5-209*.
12. Install the tire and wheels. Refer to *Tire and Wheel Removal and Installation on page 15-51*
13. Remove the support and lower the vehicle.
14. Inspect the trim height and adjust as required. Refer to *Trim Height Inspection on page 15-35*.

Wheel Stud Replacement

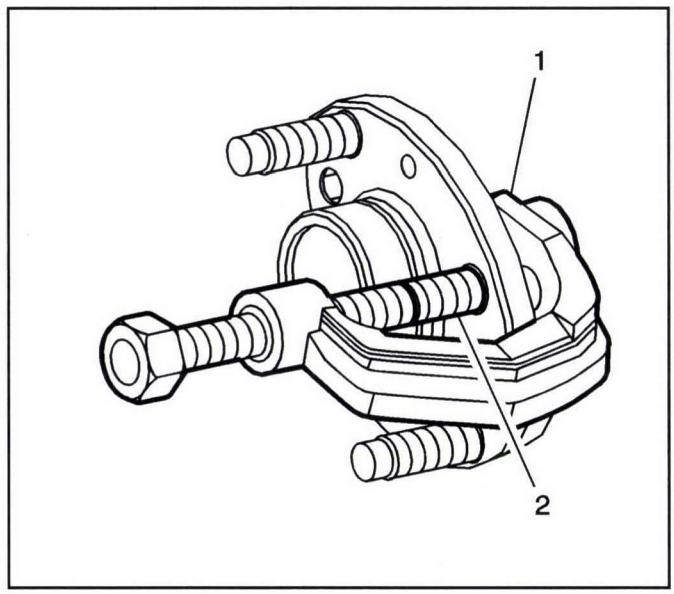
Special Tools

CH-43631 Ball Joint Separator

For equivalent regional tools, refer to *Special Tools on page 15-27*.

Removal Procedure

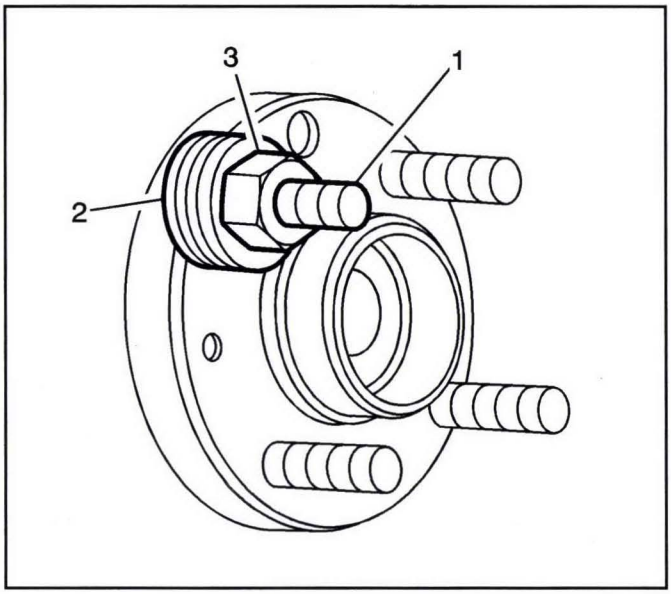
1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*.
2. Remove the rear wheel bearing and hub assembly. Refer to *Rear Wheel Bearing and Hub Replacement on page 15-19*.



3239370

3. Use the *CH-43631* separator (1) to remove the wheel stud (2) from the rear wheel bearing and hub assembly. Discard the stud.

Installation Procedure



3239361

1. Position the NEW wheel stud (1) in the rear wheel bearing and hub assembly.
2. Install flat washers (2) and an old wheel nut (3) on the wheel stud (1).
3. Use a suitable tool to prevent the flange on the bearing and hub assembly from turning.
4. Tighten the wheel nut (3) until the wheel stud (1) is firmly seated.
5. Remove the wheel nut (3) and flat washers (2).
6. Install the rear wheel bearing and hub assembly. Refer to *Rear Wheel Bearing and Hub Replacement on page 15-19*.

Description and Operation

Rear Suspension Description and Operation

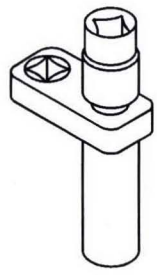
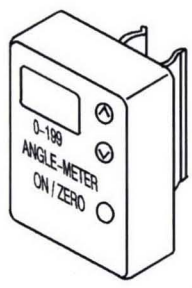
This vehicle has a semi-independent twist-beam rear suspension system consisting of the following components:

- An axle with integral trailing arms
- A "V" shaped twisting cross beam
- Two coil springs
- Two shock absorbers

Axle Assembly

The axle assembly attaches to the underbody through a rubber bushing and bracket located at the front of each integral trailing arm. The brackets are integrated to the underbody side rails. The axle structure itself maintains the geometrical relationship of the wheels relative to the centerline of the body.

Special Tools and Equipment

Illustration	Tool Number / Description
 400167	CH 43631 J-43461 Ball Joint Remover
 2866882	CH-51095 Wrench
 1197696	EN-45059 J-45059 Torque Angle Sensor Kit

Suspension General Diagnosis

Specifications

Trim Height Specifications

For description of trim height inspection. Refer to *Trim Height Inspection on page 15-35*

Trim Height Specifications

Model / Option	Tire Size Front	Tire Size Rear	Suspension Height mm (in)		Trim Height mm (in)	
			Front Suspension Height 'Z' ± 10 mm (0.39 in)	Rear Suspension Height 'D' ± 10 mm (0.39 in)	Front Trim Height 'P' ± 12 mm (0.47 in)	Rear Trim Height 'R' ± 12 mm (0.47 in)
All	P185/55 R15	P195/55 R15	45 mm (1.77 in)	87 mm (3.43 in)	618 mm (24.33 in)	624 mm (24.57 in)
All measurements are for reference only and intended to be a guide. (Nominal curb weight)						

Diagnostic Information and Procedures

Symptoms - Suspension General Diagnosis

Note: The following step must be completed before using the symptom tables.

Review the system description and operation in order to familiarize yourself with the system functions. Refer to the appropriate description and operation:

- *Front Suspension Description and Operation on page 15-17*
- *Rear Suspension Description and Operation on page 15-27*

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of any of the suspension subsystems.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect for correct tire size and inflation pressure.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- *Ride Diagnosis on page 15-28*
- *Vehicle Leads/Pulls on page 15-29*
- *Body Leans or Sways in Corners on page 15-30*
- *Suspension Bottoms on page 15-30*
- *Torque Steer on page 15-30*
- *Memory Steer on page 15-31*
- *Noise Diagnosis - Front Suspension on page 15-32*
- *Noise Diagnosis - Rear Suspension on page 15-33*

Ride Diagnosis

Step	Action	Yes	No
1	Did you review the General Description and perform the necessary inspections?	Go to *Step 2*	Go to *Symptoms - Suspension General Diagnosis on page 15-28*
2	**Note:** Verify the vehicle suspension package RPO. Verify that the ride is too soft or too hard. Does the vehicle ride normally?	System OK	Go to *Step 3*
3	Inspect the tire inflation and adjust to specifications. Refer to *Tire Inflation Description on page 15-61*. Did you adjust the tire pressure?	Go to *Step 6*	Go to *Step 4*

Ride Diagnosis (cont'd)

Step	Action	Yes	No
4	Inspect the vehicle trim height. Refer to *Trim Height Inspection on page 15-35*. Did you find and correct the condition?	Go to *Step 6*	Go to *Step 5*
5	Inspect the following suspension components for wear or damage: • Shock absorbers—Refer to *Suspension Strut and Shock Absorber Testing - On Vehicle on page 15-34*. • Springs Did you find and correct the condition?	Go to *Step 6*	—
6	Drive the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to *Step 3*

Vehicle Leads/Pulls

Step	Action	Yes	No
DEFINITION: At a constant highway speed on a typical straight road, lead/pull is the amount of effort required at the steering wheel to maintain the vehicle straight path.			
1	Did you review the General Description and perform the visual/physical inspections?	Go to *Step 2*	Go to *Symptoms - Suspension General Diagnosis on page 15-28*
2	Road test the vehicle in order to verify the complaint. Does the vehicle operate normally?	System OK	Go to *Step 3*
3	Inspect the tire/wheel assemblies for the following conditions: • Correct tire pressure—Refer to the tire placard. • Correct tire size—Refer to the tire placard. • Abnormal tire wear or damage Did you find and correct the condition?	Go to *Step 9*	Go to *Step 4*
4	Perform the *Radial Tire Lead/Pull Correction on page 15-50*. Did you find and correct the condition?	Go to *Step 9*	Go to *Step 5*
5	Inspect and correct/adjust the suspension and steering systems for the following conditions: • Vehicle trim height—Refer to *Trim Height Specifications on page 15-28*. • Excessively worn, loose, or damaged components Did you find and correct the condition?	Go to *Step 9*	Go to *Step 6*
6	Inspect the brake system for brake drag. With the vehicle suspended on a hoist, brake drag can be identified by rotating each wheel several times and observing whether more force is needed to rotate the left wheel or the right wheel. Did you find and correct the condition?	Go to *Step 9*	Go to *Step 7*
7	Inspect the wheel alignment and adjust as necessary. Refer to *Wheel Alignment Measurement on page 15-63*. Did you correct the condition?	Go to *Step 9*	Go to *Step 8*
8	Inspect the steering gear for unequal effort. The vehicle must be suspended on a hoist, the engine running, and the transmission in PARK or NEUTRAL. Grasp the tire assembly and manually simulate a turn from the left of center and the right of center observing whether more force is needed to turn to the left or to the right. If this condition exists replace the steering gear. Did you correct the condition?	System OK	Go to *Step 3*
9	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to *Step 3*

Body Leans or Sways in Corners

Step	Action	Yes	No
1	Did you review the General Description and perform the necessary inspections?	Go to *Step 2*	Go to *Symptoms - Suspension General Diagnosis on page 15-28*
2	Verify the vehicle leans or sways in corners. Does the vehicle operate normally?	System OK	Go to *Step 3*
3	Inspect the following components for wear or damage: • Front coil springs • Rear coil springs Are the components worn or damaged?	Go to *Step 5*	Go to *Step 4*
4	1. Inspect the stabilizer shaft link for wear or damage. 2. Replace as necessary. Did you find and correct the condition?	Go to *Step 6*	Go to *Step 2*
5	Replace the springs as necessary. Did you complete the repair?	Go to *Step 6*	—
6	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to *Step 3*

Suspension Bottoms

Step	Action	Yes	No
DEFINITION: A loud bang or thump that can usually be felt and/or heard when the vehicle is driven over bumps. This condition is commonly noticed when the vehicle trim height is too low.			
1	Did you review the General Description and perform the necessary inspections?	Go to *Step 2*	Go to *Symptoms - Suspension General Diagnosis on page 15-28*
2	Verify that the suspension bottoms. Does the vehicle operate normally?	System OK	Go to *Step 3*
3	Inspect for vehicle overloading and correct the overloading condition as necessary. Did you find and correct the condition?	Go to *Step 6*	Go to *Step 4*
4	Inspect the following components: • Inspect the shock absorbers. Refer to *Suspension Strut and Shock Absorber Testing - On Vehicle on page 15-34*. • Inspect for damaged coil springs and torsion bar, and replace as necessary. Did you find and correct the condition?	Go to *Step 6*	Go to *Step 5*
5	Inspect the vehicle trim height. Refer to *Trim Height Inspection on page 15-35*. Did you complete the trim height inspection procedure?	Go to *Step 6*	—
6	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to *Step 3*

Torque Steer

Step	Action	Yes	No
DEFINITION: On a dry, smooth, flat road, the vehicle has a left or right steering force only during acceleration.			
1	Did you review the General Description and perform the necessary inspections?	Go to *Step 2*	Go to *Symptoms - Suspension General Diagnosis on page 15-28*

Torque Steer (cont'd)

Step	Action	Yes	No
2	1. Drive the vehicle on a straight, smooth, flat road. 2. Press the accelerator and determine if any additional steering input is required to maintain a straight ahead direction. 3. Repeat this test with the vehicle traveling in the opposite direction in order to eliminate crosswind effects. Lead/pull caused by unlevel roads and crosswinds are considered normal. Does the vehicle exhibit torque steer when the accelerator is pressed?	Go to *Step 3*	System OK
3	1. Drive the vehicle on a straight, smooth, flat road at 64–97 km/h (40–60 mph). 2. Remove your foot from the accelerator. 3. Shift the transmission into NEUTRAL in order to allow the vehicle to coast. 4. Is any additional steering input required to maintain a straight ahead direction? 5. Repeat this test with the vehicle traveling in the opposite direction in order to eliminate crosswind effects. Lead/pull caused by unlevel roads and crosswinds are considered normal. Does the vehicle direction change when the steering wheel is momentarily released?	Go to *Vehicle Leads/ Pulls on page 15-29*	Go to *Step 4*
4	Inspect the front suspension and powertrain mounts for worn or damaged components and repair as necessary. Did you find and correct the condition?	Go to *Step 6*	Go to *Step 5*
5	Inspect the vehicle trim height. Refer to *Trim Height Inspection on page 15-35*. Did you find and correct the condition?	Go to *Step 6*	—
6	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	—

Memory Steer

Step	Action	Yes	No
DEFINITION: A lead or pull in the direction the driver previously turned the vehicle. Additionally, after turning in the opposite direction, the vehicle will want to lead or pull in that direction.			
1	Did you review the General Description and perform the necessary inspections?	Go to *Step 2*	Go to *Symptoms - Suspension General Diagnosis on page 15-28*
2	Verify that memory steer is present. Does the system operate normally?	System OK	Go to *Step 3*
3	1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Lubricate the tie rod ends and the ball joints if applicable. 3. Inspect the suspension system for worn or damaged components. 4. Repair as necessary. Did you find and correct the condition?	Go to *Step 7*	Go to *Step 4*
4	Inspect for binding strut bearings. 1. Disconnect the strut from the steering knuckle. 2. If the strut is abnormally difficult to rotate, repair or replace the upper bearing mount. Did you find and complete the repair?	Go to *Step 7*	Go to *Step 5*

Memory Steer (cont'd)

Step	Action	Yes	No
5	Inspect for binding in the lower ball joints. If the joint is binding, replace the joint. Did you find and complete the repair?	Go to *Step 7*	Go to *Step 6*
6	Inspect the wheel alignment and adjust as necessary. Refer to *Wheel Alignment Measurement on page 15-63*. Did you complete the wheel alignment?	Go to *Step 7*	—
7	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	—

Noise Diagnosis - Front Suspension

Step	Action	Yes	No
DEFINITION: Any noise emitted from the front of the vehicle that is induced by VEHICLE SPEED or DRIVING TERRAIN as related to the front suspension.			
1	Did you review the General Description and perform the necessary Inspections?	Go to *Step 2*	Go to *Symptoms - Suspension General Diagnosis on page 15-28*
2	Attempt to duplicate the condition. Road test the vehicle. Did you duplicate the condition?	Go to *Step 3*	System OK
3	Is the noise reactive to vehicle load or speed?	Go to *Step 4*	Go to *Step 7*
4	Inspect the tires for the following condition: • Proper tire inflation and adjust as necessary—Refer to *Tire Inflation Description on page 15-61*. • Unusual tire wear—Refer to *Tire Diagnosis - Irregular or Premature Wear on page 15-49*. • Inspect the wheel nuts for looseness and tighten as necessary. Refer to *Fastener Tightening Specifications on page 15-48*. Did you find and correct the condition?	Go to *Step 14*	Go to *Step 5*
5	Inspect the front wheel bearings. Refer to *Wheel Bearings Diagnosis on page 15-34*. Did you find and correct the condition?	Go to *Step 14*	Go to *Step 6*
6	Inspect for front axle or transaxle noises. Refer to *Symptoms - Automatic Transmission on page 16-25*. Did you find and correct the condition?	Go to *Step 14*	Go to *Step 7*
7	Bounce the front of the vehicle in order to duplicate the noise. Did you duplicate the noise?	Go to *Step 8*	Go to *Step 9*
8	1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Inspect the front suspension components for looseness. Refer to *Fastener Tightening Specifications on page 15-3*. 3. Inspect the front suspension components for damage and repair as necessary. Did you find and correct the condition?	Go to *Step 14*	Go to *Step 9*
9	1. Install the *CH-39570* chassis ear or equivalent. 2. Bounce the front of the vehicle, using *CH-39570* chassis ear or equivalent in order to locate the source of the noise. If necessary road test the vehicle. 3. Repair or replace any damaged components as necessary. Did you find and correct the condition?	Go to *Step 14*	Go to *Step 10*

Noise Diagnosis - Front Suspension (cont'd)

Step	Action	Yes	No
10	Inspect the ball joints and steering components for the following conditions: • Lack of lubrication where applicable • Looseness in the ball joints • Looseness in the tie rods Did you find and correct the condition?	Go to *Step 14*	Go to *Step 11*
11	Inspect for damaged shock absorbers. Refer to *Suspension Strut and Shock Absorber Testing - On Vehicle on page 15-34*. Did you find and correct the condition?	Go to *Step 14*	Go to *Step 12*
12	Inspect the front stabilizer shaft and stabilizer shaft links for damage and repair as necessary. Refer to *Stabilizer Shaft Replacement on page 15-4* or *Stabilizer Shaft Link Replacement on page 15-5*. Did you find and correct the condition?	Go to *Step 14*	Go to *Step 13*
13	Inspect for control arm damage and repair as necessary. Refer to *Lower Control Arm Replacement on page 15-9*. Did you find and correct the condition?	Go to *Step 14*	—
14	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to *Step 3*

Noise Diagnosis - Rear Suspension

Step	Action	Yes	No
DEFINITION: Any noise emitted from the rear of the vehicle that is induced by VEHICLE SPEED or DRIVING TERRAIN as related to the rear suspension.			
1	Did you review the General Description and perform the necessary inspections?	Go to *Step 2*	Go to *Symptoms - Suspension General Diagnosis on page 15-28*
2	Attempt to duplicate the condition. Road test the vehicle. Did you duplicate the condition?	Go to *Step 3*	System OK
3	Is the noise reactive to vehicle load or speed?	Go to *Step 4*	Go to *Step 6*
4	Perform the following inspections: • Inspect and adjust the tire inflation. Refer to *Tire Inflation Description on page 15-61*. • Inspect for unusual tire wear. Refer to *Tire Diagnosis - Irregular or Premature Wear on page 15-49*. • Inspect the wheel nuts for looseness. Refer to *Fastener Tightening Specifications on page 15-48*. Did you find and correct the condition?	Go to *Step 10*	Go to *Step 5*
5	Inspect the rear wheel bearings. Refer to *Wheel Bearings Diagnosis on page 15-34*. Did you find and correct the condition?	Go to *Step 10*	Go to *Step 6*
6	Bounce the rear of the vehicle in order to duplicate the noise. Did you duplicate the noise?	Go to *Step 7*	Go to *Step 9*
7	1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Inspect the rear suspension components for looseness. Refer to *Fastener Tightening Specifications on page 15-19*. 3. Inspect the rear suspension components for damage and repair as necessary. Did you find and correct the condition?	Go to *Step 10*	Go to *Step 8*
8	Inspect the rear shock absorber. Refer to *Suspension Strut and Shock Absorber Testing - On Vehicle on page 15-34*. Did you find and correct the condition?	Go to *Step 10*	Go to *Step 9*

Noise Diagnosis - Rear Suspension (cont'd)

Step	Action	Yes	No
9	1. Install the *CH-39570* chassis ear or equivalent. 2. Bounce the rear of the vehicle, using *CH-39570* chassis ear or equivalent, in order to locate the source of the noise. If necessary, road test the vehicle. 3. Repair or replace any defect component as necessary. Did you find and correct the condition?	Go to *Step 10*	System OK
10	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to *Step 3*

Suspension Strut and Shock Absorber Testing - On Vehicle

Step	Action	Yes	No
1	Did you review the General Description and perform the necessary inspections?	Go to *Step 2*	Go to *Symptoms - Suspension General Diagnosis on page 15-28*
2	Verify that the customer concern is present. Does the vehicle operate normally?	System OK	Go to *Step 3*
3	**Note:** A light film of oil on the top portion of the shock reservoir is normal. Inspect each strut or shock absorber for external fluid leakage. Is a strut or shock absorber leaking?	Go to *Step 5*	Go to *Step 4*
4	1. Use your hands in order to lift up and push down each corner of the vehicle 3 times. 2. Remove your hands from the vehicle. 3. Locate a shock or strut that exceeds 2 cycles. Did you locate a shock or strut that exceeds 2 cycles?	Go to *Step 5*	Go to *Step 6*
5	**Note:** Inspect the vehicle trim height in order to correct any possible causes of shock/strut failures. Refer to *Trim Height Inspection on page 15-35*. Replace the strut or shock absorber. Refer to *Strut, Strut Component, or Spring Replacement on page 15-15* or *Shock Absorber Replacement on page 15-22*. Did you complete the repair?	Go to *Step 6*	—
6	Operate the vehicle in order to verify the repair. Did you correct the condition?	System OK	Go to *Step 3*

Wheel Bearings Diagnosis

Step	Action	Yes	No
1	Did you review the General Description and perform the necessary inspections?	Go to *Step 2*	Go to *Symptoms - Suspension General Diagnosis on page 15-28*
2	Road test the vehicle in order to verify the customer's complaint. Does the vehicle operate normally?	System OK	Go to *Step 3*
3	1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Inspect for tire or wheel damage. Did you find and correct the condition?	Go to *Step 7*	Go to *Step 4*

Wheel Bearings Diagnosis (cont'd)

Step	Action	Yes	No
4	1. Install the *CH-39570* chassis ear. 2. Road test the vehicle to verify the location of the wheel bearing noise. Did you find and correct the condition?	Go to *Step 6*	Go to *Step 5*
5	**Note:** Support the vehicle by the lower control arms or the rear axle to prevent movement during wheel bearing/hub inspection. 1. Mount and secure the *J-8001* dial indicator. 2. Ensure that the dial indicator contacts the vertical surface of the wheel as close as possible to the top wheel stud. 3. Push and pull on the top of the tire in order to inspect the total travel indicated by the dial indicator. **Specification** Maximum allowable wheel bearing end play: 0.127 mm (0.005 in) Is the measurement greater then the specified value?	Go to *Step 6*	System OK
6	Replace the wheel bearing. Refer to *Front Wheel Bearing and Hub Replacement on page 15-5* or *Rear Wheel Bearing and Hub Replacement on page 15-19*. Did you complete the repair?	Go to *Step 7*	—
7	Road test the vehicle to verify the repair. Does the vehicle operate normally?	System OK	Go to *Step 3*

Trim Height Inspection

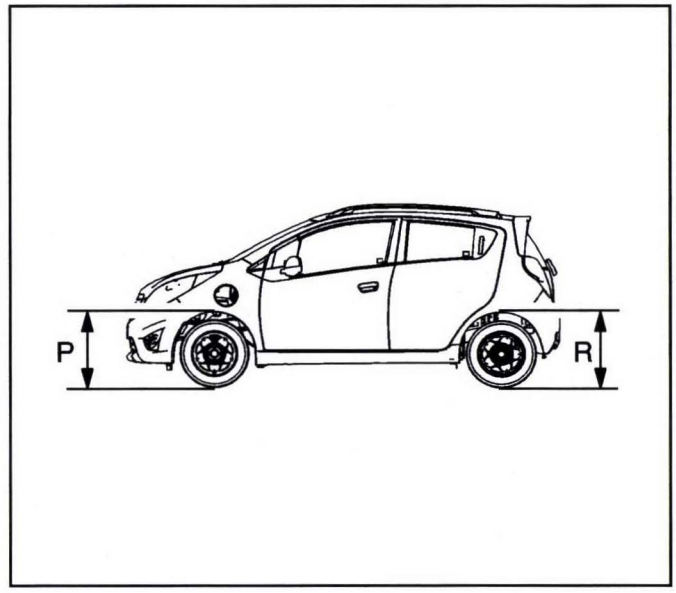
Trim Height Measurement

Trim height is a predetermined measurement relating to vehicle ride height. Incorrect trim heights can cause the vehicle to bottom out over bumps, damage to the suspension components and symptoms similar to wheel alignment problems. Check the trim heights when diagnosing suspension concerns and before checking the wheel alignment.

Perform the following before measuring the trim heights:

- Set the tire pressure to the specifications shown on the certification label. Refer to *Tire Inflation Description on page 15-61*.
- Check the fuel level. Add additional weight if necessary to simulate a full tank.
- Make sure the passenger and rear compartments are empty, except for the spare tire.
- Make sure the vehicle is on a flat and level surface, such as an alignment rack.
- Check that all the vehicle doors are securely closed.
- Check that the vehicle hood and rear deck lids are securely closed.
- Check for installed after market accessories or modifications that could affect trim height measurement.

Measuring the P and R Dimension



3394718

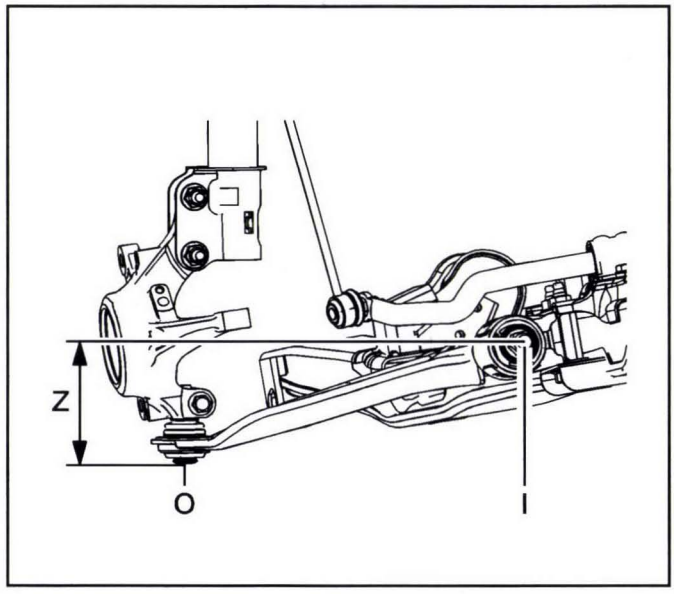
Measurement Definitions

- P Height: The vertical distance from the ground to the top of the wheel opening through the centerline of the front wheel.
- R Height: The vertical distance from the ground to the top of the wheel opening through the centerline of the rear wheel.

Note: Measure from the TOP of the wheel well opening to the ground. The left and right P and R height differences should be no more than **10 mm (0.39 in)**.

1. Use the following procedure to measure the P and R dimensions:
2. Push the bumper down a minimum of **25 mm (0.98 in)** and release. Perform this step three times.
3. Measure and record the trim height per the Measurement Definitions above.
4. Lift the bumper up a minimum of **25 mm (0.98 in)** and release. Perform this step three times
5. Measure and record the trim height per the Measurement Definitions above.
6. The true P height measurement is the average of the measurements taken in step 2 and 4. Refer to *Trim Height Specifications on page 15-28*.
7. Repeat the above steps at the rear of the vehicle for R heights.
8. If the P and R heights are outside of the specifications, measure the Z and D heights.

Measuring the Z Dimension



3394650

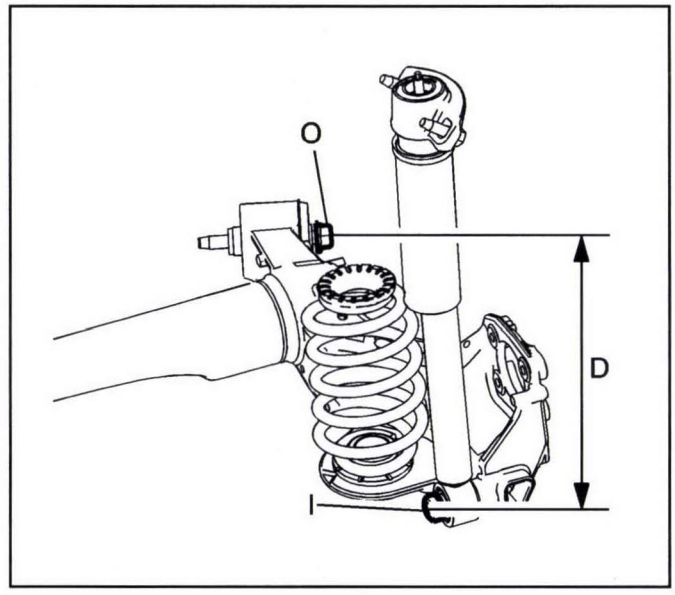
Measurement Definition

- The Z height (I – O) : The vertical distance from the center of the lower control arm rear bolt (I) , in line fore / aft with the center of the ball joint cup (O) .

Note: The left and right Z height differences should be no more than **10 mm (0.39 in)**.

1. Use the following procedures to measure the Z dimensions:
2. Push the front bumper down a minimum of **25 mm (0.98 in)** and release. Perform this step three times.
3. Measure and record the trim height per the Measurement Definition above.
4. Lift the front bumper a minimum of **25 mm (0.98 in)** and release. Perform this step three times.
5. Measure and record the trim height per the Measurement Definitions above.
6. True Z height dimension is the average of the measurements taken in steps 3 and 5. Refer to *Trim Height Specifications on page 15-28*.
7. If these measurements are out of specifications, inspect for worn or damaged suspension components and collision damage.

Measuring the D Dimension



3394703

Measurement Definition

- The D height (I –O): The vertical distance from the center of the shock absorber lower bolt (I) to the center of the rear axle trailing arm bolt (O) .

1. Use the following procedure to check the D dimension:

Note: The left and right D height difference should be no more than **10 mm (0.39 in)**.

2. Push the rear bumper down a minimum of **25 mm (0.98 in)** and release. Perform this step three times.
3. Measure and record the trim height per the Measurement Definitions above.
4. Lift the rear bumper down a minimum of **25 mm (0.98 in)** and release. Perform this step three times.
5. Measure and record the trim height per the Measurement Definitions above.
6. The true D height is the average of the measurement taken in steps 3 and 5. Refer to *Trim Height Specifications on page 15-28*.
7. If these measurements are out of specifications, inspect for worn or damaged suspension components and collision damage.

Tire Pressure Monitoring

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Tire Pressure Sensor Screw	1.3 N•m	11.5 lb in

Diagnostic Information and Procedures

DTC C0569

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC C0569 00: System Configuration Malfunction

Circuit/System Description

If the tire type and pressure information is not entered with the scan tool during the body control module (BCM) setup, the tire pressure monitor system indicator icon on the instrument cluster will flash for 1 min. and then remain illuminated after the power switch is cycled ON and the instrument cluster bulb check is complete. If equipped, the driver information center will also display a service tire monitor type message. Under these circumstances, DTC C0569 will be set and the tire type and pressure information will need to be entered for the system to function correctly.

Conditions for Running the DTC

Vehicle ON or Vehicle in Service Mode.

Conditions for Setting the DTC

The tire type and pressure information is not entered into the BCM during programming and setup.

Action Taken When the DTC Sets

- The tire pressure monitor system indicator icon on the instrument cluster flashes for 1 minute and then remains illuminated after the power switch is cycled ON and the instrument cluster bulb check is complete.
- If equipped, the driver information center displays a service tire monitor type message.

Conditions for Clearing the DTC

A current DTC will clear when the BCM has undergone the tire type and pressure selection setup procedure and 1 power switch cycle has occurred.

Diagnostic Aids

A newly replaced BCM will set DTC C0569 after programming on its initial power ON cycle if the module setup information has not been entered.

Reference Information

Description and Operation

Tire Pressure Monitor Description and Operation on page 15-46

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Enter the Tire Type and Pressure information with a scan tool into the K9 body control module. Refer to *Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label on page 1-12*.
3. Vehicle OFF, then Vehicle in Service Mode.
4. Verify DTC C0569 is not set.

⇒ **If the DTC is set**

Replace the K9 body control module.

⇓ **If the DTC is not set.**

5. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for BCM replacement, programming, and setup.

DTC C0750, C0755, C0760, or C0765

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC C0750 03: Left Front Tire Pressure Sensor Low Voltage
DTC C0750 29: Left Front Tire Pressure Sensor Too Few Pulses
DTC C0750 39: Left Front Tire Pressure Sensor Internal Malfunction
DTC C0755 03: Right Front Tire Pressure Sensor Low Voltage
DTC C0755 29: Right Front Tire Pressure Sensor Too Few Pulses
DTC C0755 39: Right Front Tire Pressure Sensor Internal Malfunction
DTC C0760 03: Left Rear Tire Pressure Sensor Low Voltage
DTC C0760 29: Left Rear Tire Pressure Sensor Too Few Pulses
DTC C0760 39: Left Rear Tire Pressure Sensor Internal Malfunction
DTC C0765 03: Right Rear Tire Pressure Sensor Low Voltage
DTC C0765 29: Right Rear Tire Pressure Sensor Too Few Pulses
DTC C0765 39: Right Rear Tire Pressure Sensor Internal Malfunction

Circuit/System Description

The tire pressure monitor system has a radio frequency (RF) transmitting pressure sensor in each wheel/tire assembly. As vehicle speed increases, centrifugal force puts the sensor into Drive mode. The sensors send the tire pressure data to the remote control door lock receiver (RCDLR) which in turn translates the received sensor data into sensor presence, sensor mode, and tire pressure before passing it on to body control module (BCM). Once vehicle speed is greater than 40 km/h (25 MPH), the BCM waits for the first sensor to go into Drive mode, then checks if all sensors have gone into Drive mode. If one or more sensors does not go into these modes, or does not transmit at all, the BCM will set DTC C0750, C0755, C0760, or C0765 respectively.

Conditions for Running the DTC

Vehicle speed is greater than 40 km/h (25 MPH).

Conditions for Setting the DTC

- A sensor does not transmit or transmits invalid data to the BCM.
- A sensor low battery condition.

Action Taken When the DTC Sets

- The tire pressure monitor system indicator icon on the instrument cluster flashes for 1 min and then remains illuminated after the ignition switch is cycled ON and the instrument cluster bulb check is complete.
- If equipped, the driver information center displays a service tire monitor type message.

Conditions for Clearing the DTC

A current DTC will clear when the malfunction is no longer present and one ignition cycle occurs.

Diagnostic Aids

- Some aftermarket wheel valve stem holes are located further from the wheel rim than original equipment wheels. When using the tire pressure monitor special tool to activate a sensor, ensure the tool is placed along the tire sidewall and no further than 15 cm (6 in) from the sensor and the antenna is aiming upward.
- Aftermarket wheel valve system locations can cause a sensor to not function correctly.
- A sensor may have been damaged due to a previous wheel/tire service or flat tire event.
- The use of other than GM approved tire sealants can obstruct the sensor pressure sensing port and cause inaccurate tire pressure readings. If this condition is verified, remove the sealer from the tire and replace the sensor. Refer to *Tire Pressure Indicator Sensor Replacement on page 15-43*.
- Occasionally sensor transmissions are not received by the BCM due to vehicle level radio frequency interference from items such as but not limited to aftermarket ignition systems, DVD players, CB radios, or metallic type window tinting.
- The sensor activation procedure may have to be repeated up to 3 times before determining a sensor is malfunctioning. In the event a particular sensor information is displayed on the special tool upon activation but the horn does not chirp, it may be necessary to rotate the wheel valve stem to a different position due to the RF signal being blocked by another component.

- Occasionally sensors can become mislocated due to previous tire rotations where the sensor learn procedure was not performed. Always learn the sensors to ensure the DTC set is for that actual physical corner of the vehicle. Refer to *Tire Pressure Indicator Sensor Learn on page 15-44*.
- A sensor low battery condition will set a sensor DTC but will not illuminate the low tire pressure indicator or display a message on the driver information center, if equipped. The sensor battery condition can be verified in the scan tool BCM data list. If a sensor low battery condition is indicated on the scan tool, the sensor will need to be replaced. Refer to *Tire Pressure Indicator Sensor Replacement on page 15-43*.

Reference Information

Description and Operation

Tire Pressure Monitor Description and Operation on page 15-46

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify there are no communication DTCs set along with DTC C0750, C0755, C0760, and C0765.

⇒ **If a communication DTC is set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If a communication DTC is not set**

2. Verify if all 4 tire monitor pressure sensor DTCs are not set.

⇒ If 2 or more tire monitor pressure sensor DTCs are set, test the keyless entry antenna for proper operation, or if antenna is properly seated. Refer to *Keyless Entry System Malfunction on page 12-69*

3. Perform the *Tire Pressure Indicator Sensor Learn on page 15-44*.
4. Verify the scan tool Tire Pressure Sensor Mode parameters change to Drive while driving the vehicle above 40 km/h (25 mph) for greater than 2 min.

⇒ **If a Tire Pressure Sensor Mode parameter does not change to Drive**

4.1. Replace the appropriate B2 Tire Pressure Sensor.

4.2. Perform the *Tire Pressure Indicator Sensor Learn on page 15-44*.

⇓ **If the Tire Pressure Sensor Mode parameter changes to Drive**

5. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Tire Pressure Indicator Sensor Replacement on page 15-43*
- *Tire Pressure Indicator Sensor Learn on page 15-44*

DTC C0775

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC C0775 00: Tire Pressure Monitoring System Sensors Malfunction

Circuit/System Description

If the body control module (BCM) has been reprogrammed or replaced and the tire pressure sensor learn procedure has not been performed, the tire pressure monitor system indicator icon on the instrument cluster will flash for 1 min and then remain illuminated after the power switch is cycled ON and the instrument cluster bulb check is complete. If equipped, the driver information center will also display a service tire monitor type message. Under these circumstances, DTC C0775 will be set in the BCM and the tire pressure sensor learn procedure will need to be performed for the system to function correctly.

Conditions for Running the DTC

Vehicle ON or Vehicle in Service Mode.

Conditions for Setting the DTC

The body control module (BCM) has not learned tire pressure sensor ID and location information from the tire pressure sensors.

Action Taken When the DTC Sets

- The tire pressure monitor system indicator icon on the instrument cluster will flash for 1 min and then remain illuminated after the power switch is cycled ON and the instrument cluster bulb check is complete.
- If equipped, the driver information center displays a service tire monitor type warning message.

Conditions for Clearing the DTC

A current DTC will clear when the BCM has received tire pressure sensor ID and location after tire pressure sensor indicator learn procedure has been performed.

Reference Information

Description and Operation

Tire Pressure Monitor Description and Operation on page 15-46

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Perform the *Tire Pressure Indicator Sensor Learn on page 15-44*.
2. Verify DTC C0775 is not set.

⇒ **If the DTC is set**

Replace the K9 Body Control Module.

⇓ **If the DTC is not set**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for control module replacement, programming, and setup.

Symptoms - Tire Pressure Monitoring

1. Perform the *Diagnostic System Check - Vehicle on page 6-91* , before using the Symptom Tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to *Tire Pressure Monitor Description and Operation on page 15-46*.

Visual/Physical Inspection

- Inspect if tires are inflated per placard values.
- Inspect for aftermarket devices which could affect the operation of the Tire Pressure Monitoring (TPM) System. Refer to *Checking Aftermarket Accessories on page 11-871*.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.

Symptom List

Refer to *Low Tire Pressure Indicator Malfunction on page 15-42* in order to diagnose the symptom.

Low Tire Pressure Indicator Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Circuit/System Description

The tire pressure monitor system has a radio frequency transmitting pressure sensor in each wheel/tire assembly. As vehicle speed increases, centrifugal force puts the sensor into Drive mode. The sensors send the tire pressure data to the remote control door lock receiver (RCDLR), using radio frequency (RF) transmissions. The RCDLR then decodes the RF data and passes it to the body control module (BCM). In turn, the BCM translates the data contained in the tire pressure sensor radio frequency transmissions into sensor presence, sensor mode, and tire pressure. Once vehicle speed is greater than 40 km/h (25 MPH), the BCM waits for the sensors to go into Drive mode.

Each sensor has its own unique identification (ID) code, which it transmits as part of each RF message, that must be learned into the BCM memory. Once all 4 IDs have been learned and vehicle speed is greater than 40 km/h (25 mph), the BCM continuously compares ID's and pressure data in the received transmissions to the learned ID's and vehicle placard pressures to determine if all 4 sensors are present and if one or more tires are low. If the BCM detects a low tire pressure condition or a malfunction in the system, it will send a serial data message to the instrument cluster requesting the appropriate tire pressure monitor indicator illumination and also to display the appropriate data message on the driver information center, if equipped.

Diagnostic Aids

- If unsure about the condition, cycle the power and observe the tire pressure monitor indicator icon. If the tire pressure monitor indicator icon is continuously illuminated after the instrument cluster bulb check is completed, a low tire pressure condition is present. Check the tires for damage or leaks and inflate to the tire placard specifications. Refer to *Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label on page 1-12*. If the tire pressure monitor indicator icon flashes for 1 minute after the instrument cluster bulb check is completed and then remains illuminated, a tire pressure monitor system DTC is set. Perform the *Diagnostic System Check - Vehicle on page 6-91* to proceed with the proper diagnosis.
- Temperature can greatly effect tire pressures. Low tire pressure on a cold morning may cause the tire pressure monitor indicator icon to turn ON. The air pressure in the tire increases as the ambient temperature rises or as the tire warms up while the vehicle is driven. The pressure may increase enough to exceed the predetermined low pressure threshold which will turn OFF the tire pressure monitor indicator icon .
- Some aftermarket wheel valve stem holes are located further from the wheel rim than original equipment wheels. When using the tire pressure monitor diagnostic tool to activate a sensor, ensure the tool antenna is no further than 15 cm (6 in) from the sensor and is aiming upward.
- Aftermarket wheel value stem locations can cause a sensor to not function correctly.
- A sensor may have been damaged due to a previous wheel/tire service or flat tire event. This is a courtesy item as it is not covered by warranty.
- The use of other than GM approved tire sealants can obstruct the sensor pressure sensing port and cause inaccurate tire pressure readings. If this condition is verified, remove the sealer from the tire and replace the sensor. Refer to *Tire Pressure Indicator Sensor Replacement on page 15-43*.
- The sensor activation procedure may have to be repeated up to 3 times before determining a sensor is malfunctioning. In the event a particular sensor's information is displayed on the tire pressure monitor diagnostic tool upon activation but the horn does not chirp, it may be necessary to rotate the wheel valve stem to a different position due to the RF signal is being blocked by another component.
- Occasionally sensor transmissions are not received by the BCM due to vehicle level RF interference from items such as but not limited to aftermarket power systems, DVD players, CB radios, or metallic type window tinting.

Reference Information

Description and Operation

Tire Pressure Monitor Description and Operation on page 15-46

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note: Low tire pressure in one or more tires is indicated by a continuously illuminated tire pressure monitor indicator icon after the instrument cluster bulb check is completed. If equipped with a driver information center, a check tire pressure type message will also be displayed.

When a tire pressure monitor DTC is set, the tire pressure monitor indicator icon will flash for 1 minute after the instrument cluster bulb check is completed and then remains illuminated. If equipped with a driver information center, a service tire monitor type message will also be displayed.

1. Adjust all tire pressures to the correct pressure. Refer to *Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label on page 1-12*.
2. Drive the vehicle over 40 km/h (25 mph) for greater than 2 minutes.
3. Verify the low tire pressure indicator is OFF.

⇒ **If the low tire pressure indicator is ON**

3.1. Perform the *Tire Pressure Indicator Sensor Learn on page 15-44*.

3.2. Record each sensor tire pressure parameter from the scan tool.

3.3. Check and record the tire pressures with a known accurate hand held tire pressure gauge.

3.4. Verify that the pressure readings from the scan tool do not differ more than 27.6 kPa (4 psi) from the actual tire pressure readings.

⇒ If the pressure readings differ more than 27.6 kPa (4 psi), replace the appropriate B2 tire pressure sensor then perform the *Tire Pressure Indicator Sensor Learn on page 15-44*.

⇓ If the pressure readings do not differ more than 27.6 kPa (4 psi)

3.5. Verify the BCM Tire Type and Pressure selections are setup correctly with a scan tool. Refer to the *Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label on page 1-12*.

⇒ If the BCM Tire Type and Pressure selections are incorrect, input the proper placard values for the vehicle with the scan tool then drive the vehicle over 40 km/h (25 mph) for greater than 2 minutes.

⇓ If the BCM Tire Type and Pressure selections are correct

3.6. Vehicle in Service Mode.

3.7. Verify the tire pressure monitor indicator icon turns ON and OFF when commanding All Indicators ON and OFF with a scan tool.

⇒ If the tire pressure monitor icon does not turn ON and OFF, replace the P16 instrument cluster.

⇓ If the tire pressure monitor icon turns ON and OFF

3.8. All OK

⇓ **If the tire pressure indicator is OFF**

4. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

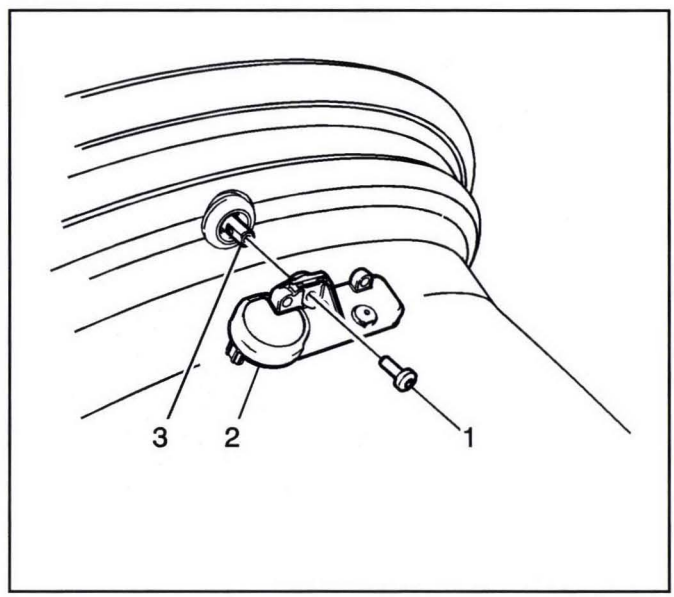
- *Tire Pressure Indicator Sensor Replacement on page 15-43*
- *Tire Pressure Indicator Sensor Learn on page 15-44*
- *Control Module References on page 6-3* for instrument cluster or BCM replacement, programming, and setup.

Repair Instructions

Tire Pressure Indicator Sensor Replacement

Removal Procedure

1. Raise the vehicle on a suitable support. Refer to *Lifting and Jacking the Vehicle on page 1-27*.
2. Remove the tire/wheel assembly from the vehicle. Refer to *Tire and Wheel Removal and Installation on page 15-51*.
3. Dismount the tire from the rim. Refer to *Tire Dismounting and Mounting on page 15-56*.



1748887

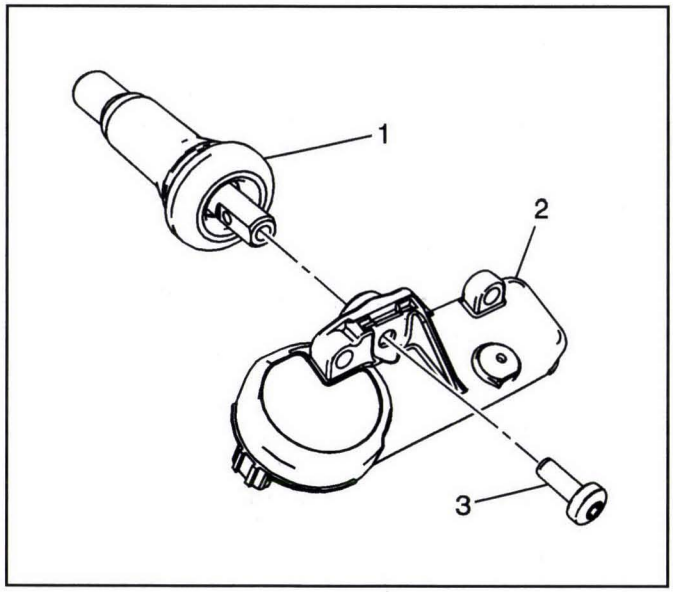
Note: When servicing the tire pressure sensor always use a new Schrader® tire pressure monitoring (TPM) sensor and a new TORX screw during installation.

4. Remove the TORX screw (1) from the tire pressure sensor (2) and pull it straight off the tire pressure valve stem (3).

Caution: Do not scratch or damage the clear coating on aluminum wheels with the tire changing equipment. Scratching the clear coating could cause the aluminum wheel to corrode and the clear coating to peel from the wheel.

5. Remove the tire pressure valve stem by pulling it through the rim.

Installation Procedure



1748899

Caution: Refer to *Fastener Caution on page 0-8*.

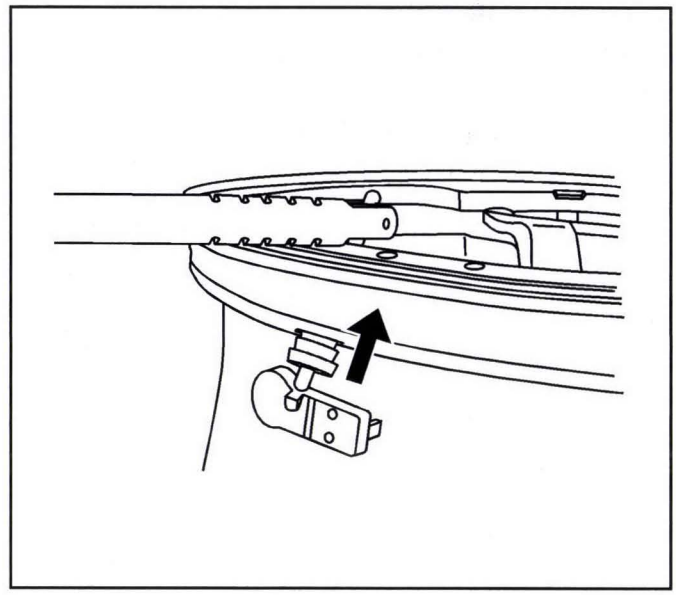
Note:

- Ensure the flat of the valve, lines up with the flats of the snap in the enclosure.
- TPM valves and TORX screws are single use items.

1. Assemble the tire pressure sensor (2) to the valve stem and install the new TORX screw (3), tighten to **1.3** N•m **(11.5 lb in)**.

   Note: Use an approved tire mounting lubricant. DO NOT use silicon or corrosive base compounds to lubricate the tire bead and the wheel rim. A corrosive type compound can cause tire or rim deterioration.

2. Apply tire soap to the rubber portion of the valve stem (1).



1749045

3. Using a tire valve stem mounting tool, pull the valve stem through in a direction parallel to the valve hole on the rim.

   Note: Snap Fit TPM sensors are shipped in the OFF mode. The sensor will exit its OFF state when the tire is inflated.

4. Mount the tire to the rim. Refer to *Tire Dismounting and Mounting on page 15-56*.
5. Install the tire/wheel assembly on the vehicle. Refer to *Tire and Wheel Removal and Installation on page 15-51*.
6. Lower the vehicle.
7. Learn the tire pressure sensors. Refer to *Tire Pressure Indicator Sensor Learn on page 15-44*.

Tire Pressure Indicator Sensor Learn

Special Tools

- *EL-46079* Tire Pressure Monitor Diagnostic Tool
- *EL-50448* Tire Pressure Monitor Sensor Activation Tool

For equivalent regional tools, refer to *Special Tools on page 15-47*

Learn Mode Description

The tire pressure monitor system uses the instrument cluster, body control module (BCM), 4 radio frequency transmitting pressure sensors, remote control door lock receiver (RCDLR) and the serial data circuit to perform the tire pressure monitor learn mode functions. The sensor Learn procedure must be performed after every tire rotation, BCM replacement, or sensor replacement. Once the Learn mode has been enabled, each of the sensors unique identification codes can be learned into the BCM memory. When a sensor ID has been learned, the BCM sounds a horn chirp indicating the sensor has transmitted its ID and the BCM has received and learned it. The BCM must learn the sensor ID's in the proper sequence to determine correct sensor location. The first learned ID is assigned to the left front location, the second to right front, the third to right rear and the

fourth to left rear. The turn signals will individually illuminate indicating which location is to be learned in the proper sequence.

Sensor Functions Using EL-46079, EL-50448, or Equivalent

Each sensor has an internal low frequency coil. When the tire pressure monitor special tools are used in activate mode, it produces a low frequency transmission that activates the sensor. The sensor responds to a low frequency activation by transmitting in Learn Mode-Remotely Triggered. When the BCM receives a Learn Mode-Remotely Triggered transmission while in tire pressure monitor Learn mode, it will assign that sensors ID to the location on the vehicle relative to the order in which it was learned.

Learn Mode Cancellation

The Learn mode will cancel if the power switch is cycled to OFF or if more than 2 minutes has elapsed for any sensor or 5 min overall has elapsed to match all four sensors. If the Learn mode is cancelled before the first sensor is learned, the original sensor ID's will be maintained. If the Learn mode is canceled after the first sensor is learned, the following will occur:

- All stored sensor ID's will be invalidated in the BCM memory.
- If equipped, the driver information center will display dashes instead of tire pressures.
- DTC C0775 will be set.

These conditions will now require the Learn procedure to be repeated for the system to function properly.

Tire Pressure Monitor Learn Procedure

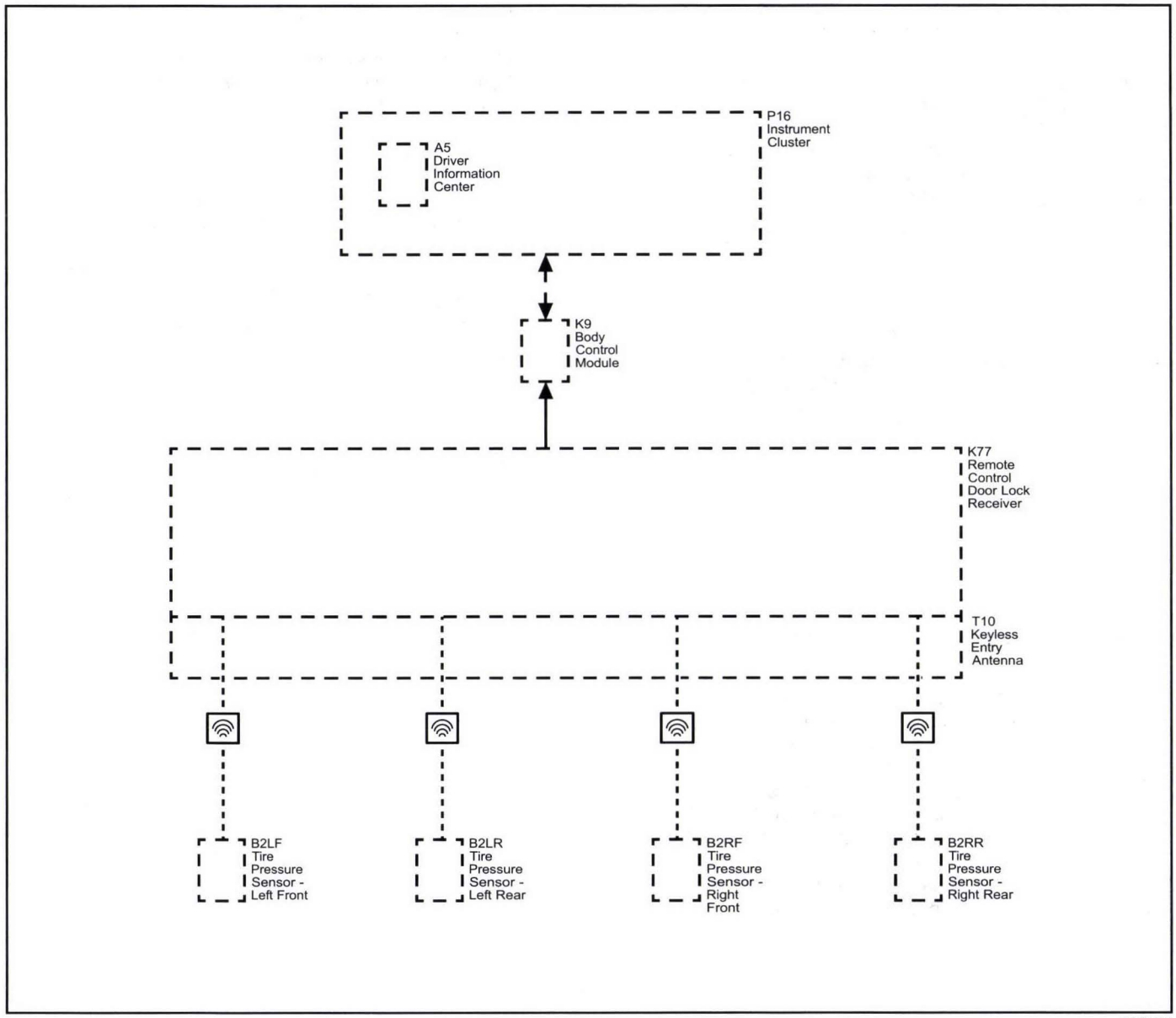
Note: In the event a particular sensor is activated and the horn does not chirp, it may be necessary to rotate the wheel so that the valve stem is in a different position due to the sensor signal is being blocked by another component. Make sure the TPM tool battery is sufficient to complete TPM learn process. Do not place the TPM tool directly on the valve stem. The TPM tool should be placed against the tire sidewall near the valve stem. The TPM sensor learn activation procedure may have to be repeated up to 3 times before determining a sensor is malfunctioning.

1. Apply park brake.
2. Vehicle in Service Mode, using a scan tool or driver information center buttons, initiate the Tire Pressure Sensors Learn mode. A double horn chirp will sound indicating the Learn mode has been enabled. The left front turn signal will also be illuminated.
3. Starting with the left front tire, active the sensor by holding the antenna of the tire pressure monitor special tool aimed upward against the tire sidewall close to the wheel rim at the valve stem location. Press and release the Activate button. Ensure that the transmit indicator on the special tool indicates that the sensor activation signal is being transmitted. Wait for a horn chirp. If the horn does not chirp, repeat the sensor activation sequence with the tool. Once the horn chirp has sounded, the sensor information is learned and the turn signal in the next location to be learned will illuminate.
4. After the horn chirp has sounded and the right front turn signal is illuminated, repeat step 3 for the remaining 3 sensors in the following order:
   4.1. Right front
   4.2. Right rear
   4.3. Left rear
5. When the left rear sensor has been learned and a double horn chirp has sounded, the learn process is complete and the BCM exits the Learn mode.

Description and Operation

Tire Pressure Monitor Description and Operation

Tire Pressure Monitoring Block Diagram



3271033

Special Tools

- *EL-46079/J-46079* Tire Pressure Monitor Diagnostic Tool
- *EL-50448* Tire Pressure Monitor Sensor Activation Tool

For equivalent regional tools, refer to *Special Tools on page 15-47*.

The tire pressure monitor system warns the driver when a significant loss of tire pressure occurs in any of the 4 tires and allows the driver to display the individual tire pressures and their locations on the driver information center.

The system uses the body control module (BCM), driver information center, instrument cluster, remote control door lock receiver (RCDLR), and a radio frequency (RF) transmitting pressure sensor in each wheel/tire assembly, and the serial data circuit to perform the system functions. Each sensor has an internal power supply with an approximate 10 year service life.

When the vehicle is stationary, the sensor's internal accelerometer is inactive, which puts the sensors into a Stationary state. In this state the sensors sample tire pressure once every 30 seconds and do not transmit at all if the tire pressure does not change. As vehicle speed increases, centrifugal force activates the sensors internal accelerometer causing the sensors to go into Wake and then Drive mode. In Drive mode, the sensors sample tire pressure once every 30 seconds and transmit in Drive mode once every 60 seconds. The RCDLR receives and translates the data contained

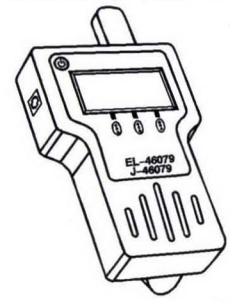
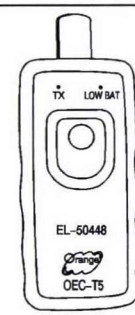
in each sensors RF transmission into sensor presence, sensor mode, and tire pressure and passes it to the BCM. In turn, the BCM sends the tire pressure and tire location data to the driver information center via the serial data circuit where they are displayed.

The sensors continuously compare their last pressure sample to their current pressure sample and will transmit in Learn Mode-Pressure Triggered if a 8.3 kPa (1.2 psi) change in tire pressure has been detected in either a Stationary or Drive state. When the tire pressure monitor system detects a significant loss of tire pressure, the tire pressure monitor indicator icon is illuminated on the instrument cluster and if equipped, a tire pressure low, add air to tire type message is displayed on the driver information center. Both the indicator icon and driver information center message can be cleared by adjusting the tire pressures to the recommended pressures and driving the vehicle above 40 km/h (25 mph) for at least 2 minutes.

If power is disconnected from the BCM or if the vehicle battery is disconnected, each tire pressure monitor sensor ID is retained but all of the tire pressure information is lost. Under these circumstances the BCM cannot assume that the tire pressures were maintained over an unknown period of time. If equipped, the driver information center will display all dashes and the scan tool will indicate a default tire pressure value of 1020 kPa (148 psi) for each tire. Driving the vehicle above 40 km/h (25 mph) for at least 2 minutes will activate the sensors causing the driver information center to display the current tire pressures. The *EL-46079/J-46079* tire pressure monitor diagnostic tool, *EL-50448* tire pressure monitor sensor activation tool, or equivalent may also be used to activate the sensors as well.

The BCM has the ability to detect malfunctions within the tire pressure monitor system. In the event a DTC is set, the tire pressure monitor indicator icon on the instrument cluster, if equipped will flash for 1 minute and then remain illuminated after the ignition is turned ON and the instrument cluster bulb check has been completed. Any malfunction detected will cause the driver information center to display a service tire monitor system type message. For more information on other functions of the BCM, refer to *Keyless Entry System Description and Operation on page 12-79*.

Special Tools and Equipment

Illustration	Tool Number/Description
 1493952	EL 46079 Tire Pressure Monitor Diagnostic Tool
 2563769	EL 50448 Tire Pressure Monitor Sensor Activation Tool

Tires and Wheels

Specifications

Tire and Wheel Specifications

Tire Inflation Pressure Specifications

Wheel	Tire Designation	Recommended Cold Inflation at Max. Load			
		Front		Rear	
		kPa	psi	kPa	psi
6.0J x 15	185/55 R15	240	35	—	—
6.5J x 15	195/55 R15	—	—	240	35

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Wheel Nuts	140 N•m	103 lb ft

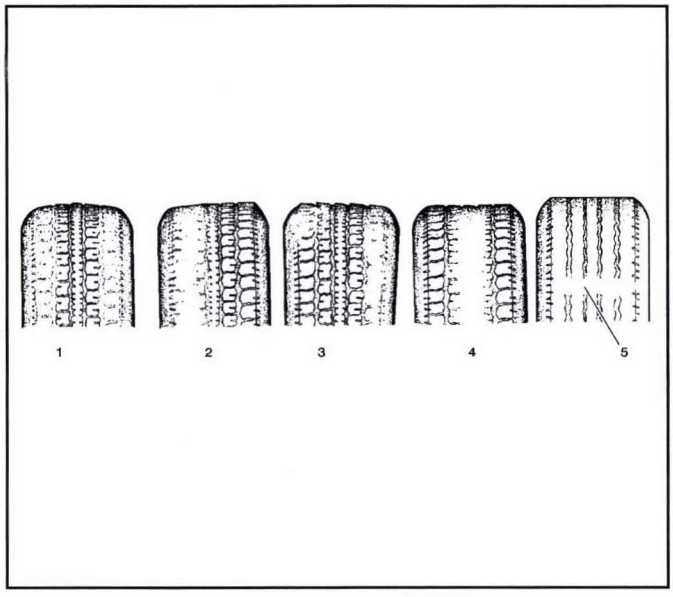
Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number	Canadian Part Number
Aluminum Wheel	Adhesive/Sealant	12378478	88900041
Aluminum Wheel	3M® General Purpose Cleaner	08984	-
Wheel	Mounting Lubricant	12345884	88863415
Wheel to Hub	Lubricant	1051344	993037

Diagnostic Information and Procedures

Tire Diagnosis - Irregular or Premature Wear

Tire Wear



2327385

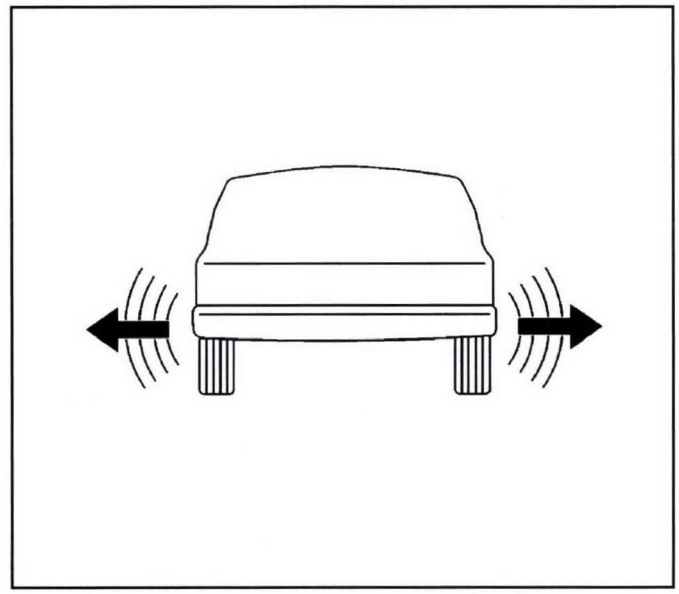
Legend

(1)	Under-Inflation, Hard Cornering, Lack of Regular Rotation
(2)	Incorrect Wheel Alignment, Hard Cornering, Lack of Regular Rotation
(3)	Incorrect Wheel Alignment, Shock Absorber Failure
(4)	Over-Inflation, Heavy Acceleration, Lack of Regular Rotation
(5)	Normal Wear to the Wear Indicator

Inspection Procedure

1. Inspect front tire for wear and damage.
2. Inspect rear tire for wear and damage.
3. Rotate the tires if any of the following conditions exist:
   - The amount of time or distance since the last tire rotation matches the maintenance schedule.
   - The outer tread blocks are worn more than the middle tread blocks (1).
   - The outer tread blocks are worn more than the inner tread blocks (2).
   - The middle tread blocks are worn more than the outer tread blocks (4).
4. Measure the wheel alignment if any of the following conditions exist:
   - The tread blocks have feathered edges (3).
   - The outer tread blocks are worn more than the inner tread blocks (2).
   - The inner tread blocks are worn more than the outer tread blocks (2).
5. Inspect the struts or the shock absorbers if the tire tread exhibits a cupped appearance (3).

Tire Diagnosis - Waddle Complaint



2327384

Tire waddle is a side to side movement at the front of the vehicle and/or the rear of the vehicle. Tire waddle can be caused by the following conditions:

- A steel belt not being straight within the tire
- Excessive lateral runout of the tire
- Excessive lateral runout of the wheel

Tire waddle is most noticeable at a low speed of about 8–48 km/h (5–30 mph). Tire waddle may appear as ride roughness at 80–113 km/h (50–70 mph). Tire waddle may appear as a vibration at 80–113 km/h (50–70 mph).

Inspection Procedure

Caution: Refer to *Lifting and Jacking the Vehicle on page 1-27*.

1. Raise and support the vehicle with safety stands.

Warning: Wear gloves when inspecting the tires in order to prevent personal injury from steel belts sticking through the tire.

2. Perform the following preliminary inspection:
   2.1. Mark the tire with a crayon in order to note the start and the stop position.
   2.2. Rotate each tire and wheel by hand.
   2.3. Inspect the tire for bulges or bent wheels. Replace as necessary.
3. Use a tire substitution in order to identify the faulty tire. Perform the following steps for a tire substitution check:
   3.1. Use a comparable tire in order to replace each tire, one at a time.
   3.2. Test drive the vehicle.
   3.3. If the problem is tire or wheel related, you will eliminate the problem when you remove the faulty tire from the vehicle.

Radial Tire Lead/Pull Correction

Step	Action	Yes	No
DEFINITION: Lead/pull is the deviation of the vehicle from a straight path on a level road with no pressure on the steering wheel.			
1	Did you perform the Vehicle Leads/Pull diagnostic table in Suspension General Diagnosis?	Go to *Step 2*	Go to *Vehicle Leads/ Pulls on page 15-29*
2	Road test the vehicle to verify the concern. Select a smooth level surface to perform the test. Does the condition exist?	Go to *Step 3*	System OK
3	Cross-switch the front tire and wheel assemblies. Did you complete the procedure?	Go to *Step 4*	—
4	Does the vehicle lead/pull in the opposite direction?	Go to *Step 5*	Go to *Wheel Alignment Measurement on page 15-63*
5	Replace the tire that is pulling in the opposite direction and then install it to its original position. Refer to *Tire Dismounting and Mounting on page 15-56*. Did you complete the replacement?	Go to *Step 6*	—
6	Verify proper vehicle operation. Does the original condition still exist?	Go to *Step 1*	System OK

Repair Instructions

Aluminum Wheel Porosity Repair

1. Remove the tire and wheel. Refer to *Tire and Wheel Removal and Installation on page 15-51*.
2. Inflate the tire to the manufactures specified pressure as stated on the tire.
3. Submerge the tire/wheel into a water bath in order to locate the leak.
4. Inscribe a mark on the wheel in order to indicate the leak areas.
5. Inscribe a mark on the tire at the valve stem in order to indicate the orientation of the tire to the wheel.

   Note: Do not damage the exterior surface of the wheel.
6. Remove the tire from the wheel. Refer to *Tire Dismounting and Mounting on page 15-56*.
7. Use number 80 grit sandpaper to scuff the inside of the rim surface at the leak area.
8. Use general purpose cleaner to clean the leak area.
9. Apply 3 mm (0.12 in) thick layer of adhesive/ sealant to the leak area.
10. Allow for the adhesive/sealant to dry.
11. Align the inscribed mark on the tire with the valve stem on the wheel.
12. Install the tire to the wheel. Refer to *Tire Dismounting and Mounting on page 15-56*.
13. Pressurize the tire to 276 kPa (40 psi).
14. Submerge the tire/wheel into a water bath in order to ensure the leak is sealed.
15. Inflate the tire to the specified pressure as stated on the tire placard.
16. Balance the tire and wheel. Refer to *Tire and Wheel Assembly Balancing - Off Vehicle on page 1-59*.
17. Install the tire and wheel. Refer to *Tire and Wheel Removal and Installation on page 15-51*.

Aluminum Wheel Refinishing

Finish Damage Evaluation Procedure

Note:

- If the wheels are chrome-plated, do not re-plate or refinish the wheels.
- If the wheels are polished aluminum, do not refinish the wheels in the dealer environment. Utilize a refinisher that meets manufacturer guidelines.

1. Inspect the wheels for damage from uncoated wheel balance weights or from automatic car wash facilities.
2. Inspect the wheels for the following conditions:
   - Corrosion
   - Scrapes
   - Gouges
3. Verify the damage is not deeper than what sanding can remove.
4. Inspect the wheels for cracks. If a wheel has cracks, discard the wheel.
5. Inspect the wheels for bent rim flanges. If a rim flange is bent, discard the wheel.

Refinishing Procedure

Warning: To avoid serious personal injury when applying any two part component paint system, follow the specific precautions provided by the paint manufacturer. Failure to follow these precautions may cause lung irritation and allergic respiratory reaction.

1. Remove the tire and wheel assembly from the vehicle. Refer to *Tire and Wheel Removal and Installation on page 15-51*.
2. Remove the balance weights from the wheel.
3. Remove the tire from the wheel. Refer to *Tire Dismounting and Mounting on page 15-56*.

   Note:

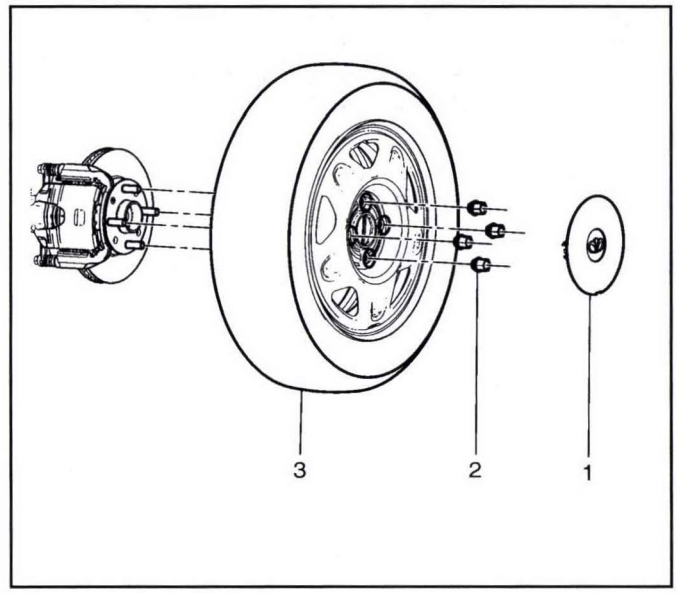
   - Do not re-machine the wheel.
   - Do not use chemicals in order to strip the paint from the wheel.
4. Use a suitable cleaner in order to remove the following contaminants from the wheel:
   - Lubricants
   - Wax
   - Dirt
5. Use plastic media blasting in order to remove the paint from the wheel.
6. If the wheel had a machined aluminum finish, spin the wheel and use sand paper in order to restore the circular machined appearance.

   Note: The wheel mounting surface and the wheel nut contact surface must remain free of paint.
7. Mask the wheel mounting surface and the wheel nut contact surface.
8. Follow the paint manufacturer instructions for painting the wheel.
9. Install a new valve stem.

   Note: Use new coated balance weights in order to balance the wheel.
10. Install the tire to the wheel. Refer to *Tire Dismounting and Mounting on page 15-56*.
11. Use a suitable cleaner in order to remove the following contaminants from the wheel mounting surface:
    - Corrosion
    - Overspray
    - Dirt
12. Install the tire and wheel assembly to the vehicle. Refer to *Tire and Wheel Removal and Installation on page 15-51*.

Tire and Wheel Removal and Installation

Removal Procedure



2327382

Caution: Refer to *Lifting and Jacking the Vehicle on page 1-27*.

1. Raise and support the vehicle.
2. Remove the wheel cap (1), if equipped.
3. Mark the wheel in relation to the wheel hub flange.
4. Remove the wheel nuts (2).

Warning: If penetrating oil gets on the vertical surfaces between the wheel and the rotor or drum it could cause the wheel to work loose as the vehicle is driven, resulting in loss of control and an injury accident.

Caution: Removing the wheel may be difficult because of foreign materials or a tight fit between the wheel and the hub/rotor. Slightly tap the tire side wall with a rubber mallet in order to remove the wheel. Failure to follow these instructions may result in damage to the wheel.

5. Remove the tire and wheel assembly (3) from the vehicle. If the tire and wheel assembly is difficult to remove, perform the following steps:
   5.1. Install and tighten all wheel nuts on the affected wheel.
   5.2. Loosen each wheel nut two turns.
   5.3. Lower the vehicle to the ground.
   5.4. Rock the vehicle from side to side.

Caution: Refer to *Lifting and Jacking the Vehicle on page 1-27*.

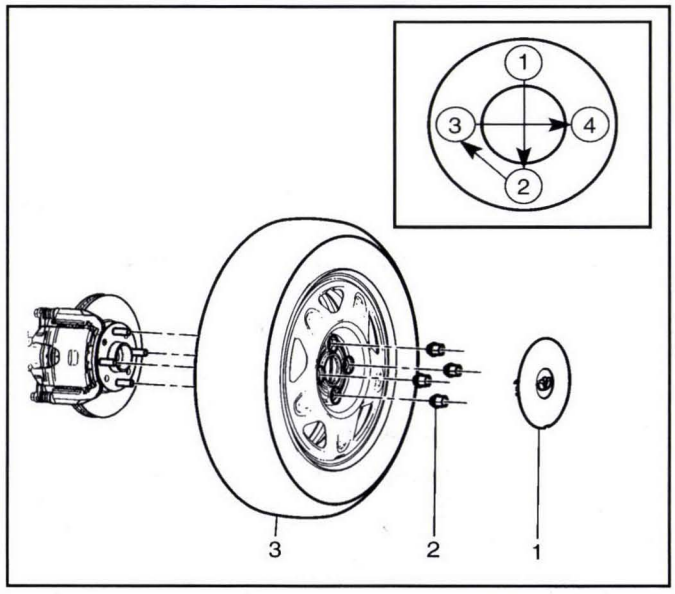
   5.5. Raise and support the vehicle.
   5.6. Remove the wheel nuts.
   5.7. Remove the tire and wheel assembly.

Installation Procedure

Warning: Before installing the wheels, remove any buildup of corrosion on the wheel mounting surface and brake drum or disc mounting surface by scraping and wire brushing. Installing wheels with poor metal-to-metal contact at the mounting surfaces can cause wheel fasteners to loosen. This can cause a wheel to come off when the vehicle is moving, causing loss of control and possibly personal injury.

Note: Wheel nuts, studs, and mounting surfaces must be clean and dry.

1. Remove any corrosion or foreign material from the wheel and the hub mounting surfaces.
2. Clean the threads on the wheel studs and wheel nuts.



2327381

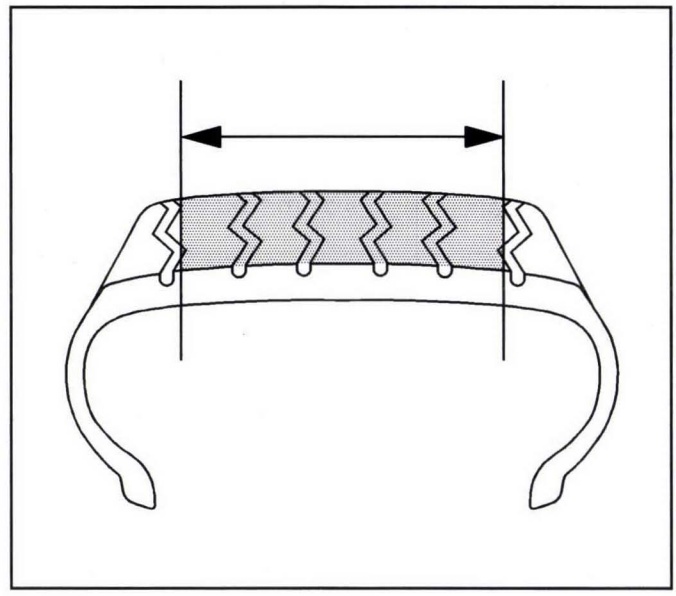
3. Install the tire and wheel assembly (3). Align the locating mark of the wheel to the hub.

Caution: Refer to *Fastener Caution on page 0-8*.

Note: Tighten the nuts evenly and alternatively in the sequence shown, in order to avoid excessive runout.

4. Install the wheel nuts (2) and tighten in sequence shown to **140** N•m **(103 lb ft)**.
5. Install the wheel cap (1), if equipped.
6. Lower the vehicle to the ground.

Tire Repair



1407477

Warning:

- ***Tire changing can be dangerous and should be done by trained professionals using proper tools and procedures. Always read and understand any manufacturer's warnings contained in their customers literature or molded into the tire sidewall.***
- ***Serious eye and ear injury may result from not wearing adequate eye and ear protection while repairing tires.***
- ***NEVER inflate beyond 275 kPa (40 pounds) pressure to seat beads.***
- ***NEVER stand, lean or reach over the assembly during inflation.***

Note: Repairable area on a radial tire.

- NEVER repair tires worn to the tread indicators 1.59 mm (2/32 in) remaining depth.
- NEVER repair tires with a tread puncture larger than 6.35 mm (1/4 in).
- NEVER substitute an inner tube for a permissible or non-permissible repair.
- NEVER perform an outside-in tire repair (plug only, on the wheel).
- Every tire must be removed from the wheel for proper inspection and repair.
- Regardless of the type of repair used, the repair must seal the inner liner and fill the injury.
- Consult with repair material supplier/manufacturer for repair unit application procedures and repair tools/repair material recommendations.

Three basic steps for tire puncture repair:

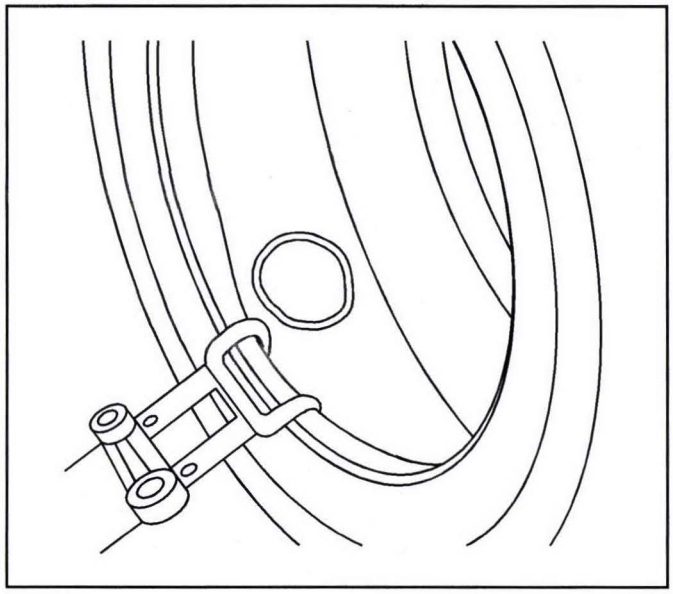
1. Remove the tire from the wheel for inspection and repair.
2. Fill the injury (puncture) to keep moisture out.

3. Seal the inner liner with a repair unit to prevent air loss.

External Inspection

1. Prior to demounting, inspect the tire surface, the valve and the wheel for the source of the leak by using a water and soap solution. Mark the injured area and totally deflate the tire by removing the valve core.
2. Demount the tire from the wheel and place the tire on a well-lighted spreader.

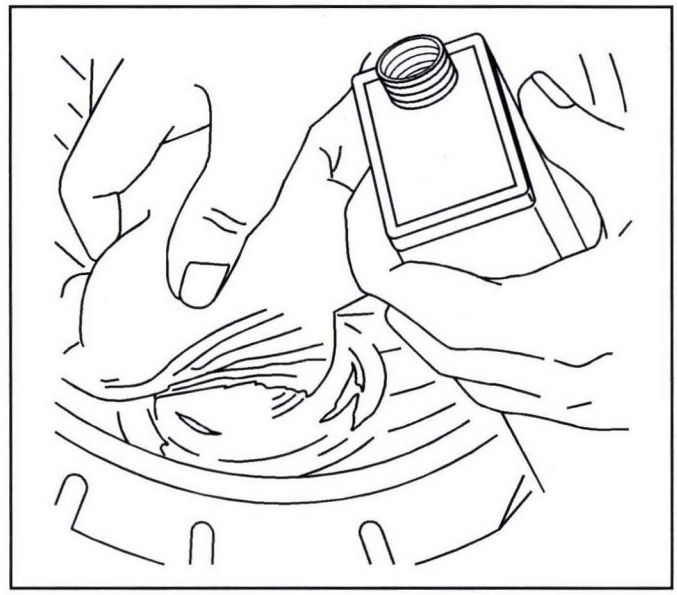
Internal Inspection



1407419

1. Spread the beads and mark the puncture with a tire crayon.
2. Inspect the inner tire for any signs of internal damage.
3. Remove the puncturing object, noting the direction of the penetration.
4. Probe the injury with a blunt awl in order to determine the extent and direction of the injury.
5. Remove any loose foreign material from the injury.
6. Punctures exceeding 6.35 mm (1/4 in) should not be repaired.

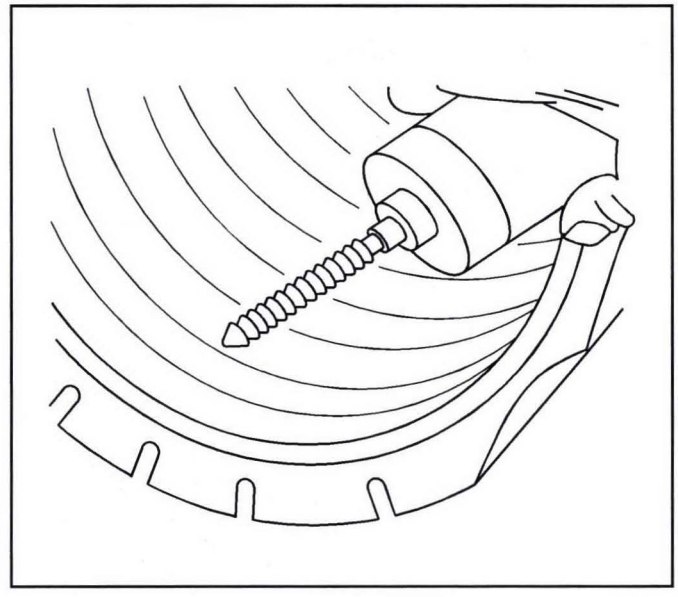
Cleaning



1407425

1. Clean the area around the puncture thoroughly with a proper liner cleaner, clean cloth and a scraper. This step serves to remove dirt and mold lubricants to insure proper adhesion and non-contamination of the buffing tool.
2. Refer to information on the product or manufacturer's Material Safety Data Sheet and follow guidelines for handling and disposal.

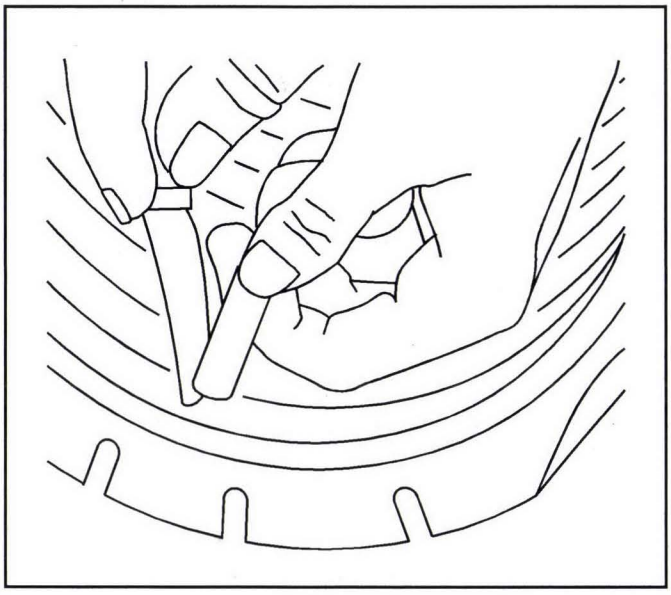
Clean the Injury Channel



1407455

1. Use a proper hand reamer, carbide cutter or drill bit to ream the puncture channel from the inside of the tire in order to clean the injury.
2. Remove steel wires protruding above the liner surface to prevent damage to the repair unit.
3. Consult your repair material supplier for recommended reaming tool(s).

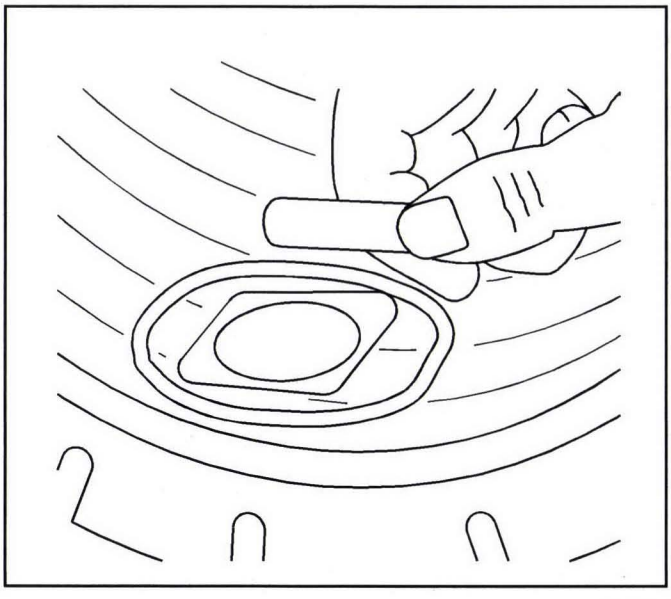
Fill the Injury



1407456

1. It is necessary to fill the injury channel to provide back up for the repair unit and to prevent moisture from entering the tire fabric and steel wires.
2. For combination repair/plug units skip this step. Cement the injured channel and fill the injury from the inside of the tire with the repair plug per repair material manufacturer's recommendations. Without stretching the plug, cut the plug off just above the inside tire surface.
3. Consult your repair material supplier for proper repair material selection.

Repair Unit Selection

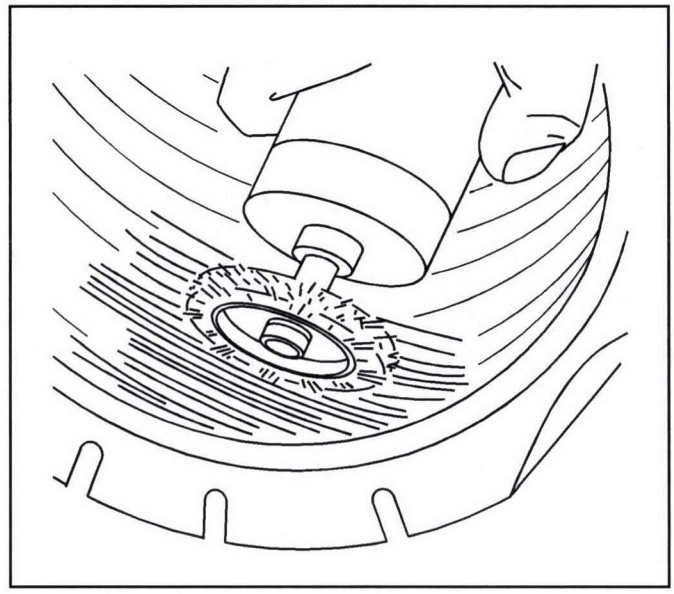


1407457

Note: Do not install the repair unit in this step.

1. Center the repair unit over the injury as a reference and outline an area larger than the unit so that buffing will not remove the crayon marks.
2. Remove the repair unit.
3. DO NOT overlap previous or multiple repair units.
4. Consult your repair material supplier for proper repair unit selection.

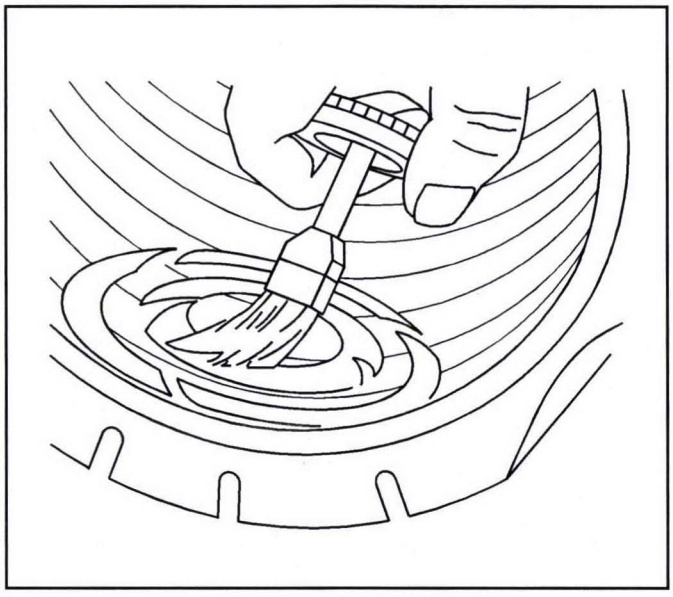
Buffing



1411033

1. To prevent contamination and preserve the outline, buff within the marked area thoroughly and evenly with a low speed buffing tool using a fine wire brush or gritted rasp.
2. Buff to a smooth velvet surface (RMA #1 or #2 buffed texture).
3. Use caution not to gouge the inner liner or expose casing fabric.
4. Remove any buffing dust with a vacuum cleaner.
5. Consult your repair material supplier for a proper buffing tool.

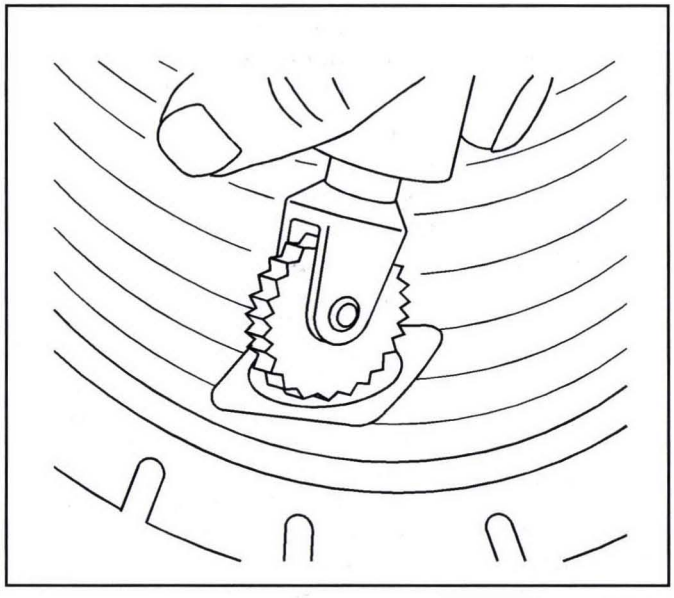
Cementing



1407463

Apply chemical cement according to the repair material manufacturer's procedures.

Repair Unit Application

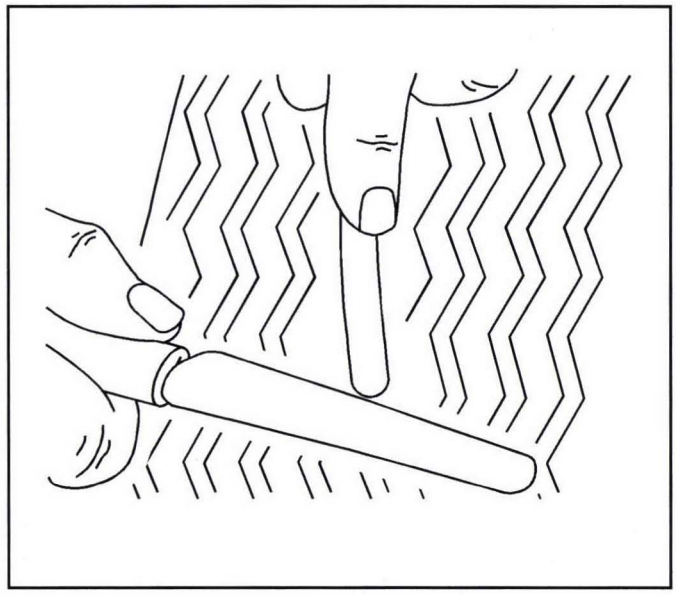


1407466

The tire must be in the relaxed position when the repair unit is installed. Do not spread the beads excessively.

Two-Piece Plug and Repair Units

1. If applicable, install the repair unit so that the alignment is correct.
2. Center the repair unit over the injury and stitch down thoroughly with the stitching tool, working from the center out.



1407471

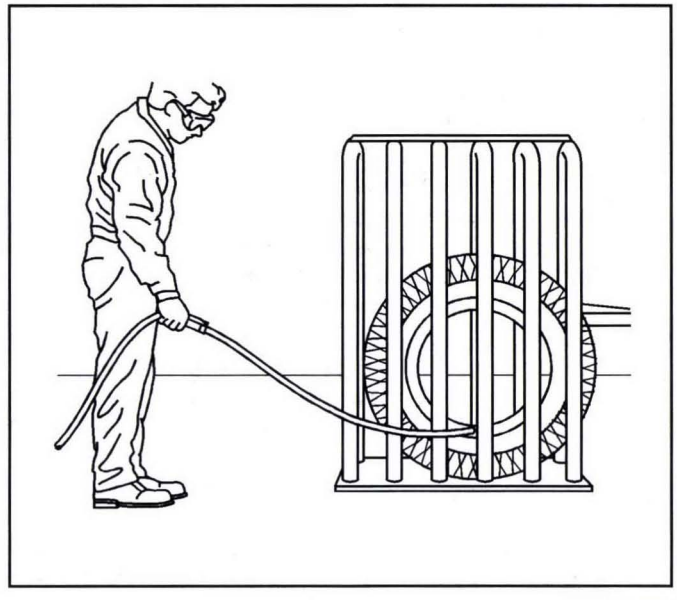
3. Being careful not to stretch the plug material, cut the plug flush with the outer tread.

Combination Repair/Plug Units

1. Pull the plug through the injury until the repair just reaches the liner. Stitch down thoroughly.
2. Follow the repair material manufacturer's recommendations for further installation instructions.

   Consult your repair material supplier for the proper stitching tool.

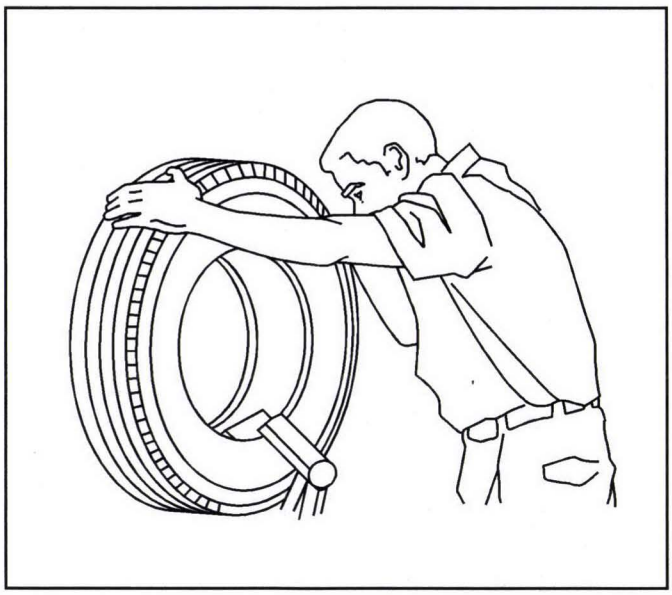
Safety Cage



1407417

Some run flat tires and high performance tires may require more than 275 kPa (40 psi) to seat the bead. In such a case, a tire safety cage must be used. Consult the tire manufacturer for its individual repair policy.

Final Inspection



1407469

1. After remounting and inflating the tire, check both beads, the repair and the valve with a water and soap solution in order to detect leaks.
2. If the tire continues to lose air, the tire must be demounted and reinspected.
3. Balance the tire and wheel assembly. Refer to *Tire and Wheel Assembly Balancing - Off Vehicle on page 1-59*.

For additional tire puncture repair information, contact:
Rubber Manufacturers Association (RMA)
1400 K Street, N.W., Suite 900
Washington, DC, 20005-2403

Telephone: 202-682-4800
E-mail: info@rma.org
Website: www.rma.org

Tire Dismounting and Mounting

Caution: Use a tire changing machine in order to dismount tires. Do not use hand tools or tire irons alone in order to remove the tire from the wheel. Damage to the tire beads or the wheel rim could result.

Caution: Do not scratch or damage the clear coating on aluminum wheels with the tire changing equipment. Scratching the clear coating could cause the aluminum wheel to corrode and the clear coating to peel from the wheel.

Caution: Damage to either the tire bead or the wheel mounting holes can result from the use of improper wheel attachment or tire mounting procedures. It takes up to 70 seconds for all of the air to completely exhaust from a large tire. Failure to follow the proper procedures could cause the tire changer to put enough force on the tire to bend the wheel at the mounting surface. Such damage may result in vibration and/or shimmy, and under severe usage lead to wheel cracking.

1. Deflate the tire completely.
2. Use the tire changer in order to remove the tire from the wheel.
3. Use a wire brush or coarse steel wool in order to remove any rubber, light rust or corrosion from the wheel bead seats.

Caution: When mounting the tires, use an approved tire mounting lubricant. DO NOT use silicon or corrosive base compounds to lubricate the tire bead and the wheel rim. A silicon base compound can cause the tire to slip on the rim. A corrosive type compound can cause tire or rim deterioration.

4. Apply an approved lubricant to the tire bead and the wheel trim.
5. Use the tire changer in order to install the tire to the wheel.

Warning: To avoid serious personal injury, do not stand over tire when inflating. The bead may break when the bead snaps over the safety hump. Do not exceed 275 kPa (40 psi) pressure when inflating any tire if beads are not seated. If 275 kPa (40 psi) pressure will not seat the beads, deflate, relubricate the beads and reinflate. Overinflation may cause the bead to break and cause serious personal injury.

6. Inflate the tire to the proper air pressure.
7. Ensure that the locating rings are visible on both sides of the tire in order to verify that the tire bead is fully seated on the wheel.

Tire and Wheel Balancing

Warning: Failure to adhere to the following precautions before tire balancing can result in personal injury or damage to components:

- ***Clean away any dirt or deposits from the inside of the wheels.***
- ***Remove any stones from the tread.***
- ***Wear eye protection.***
- ***Use coated weights on aluminum wheels.***

Tire and Wheel Assembly Balancer Calibration

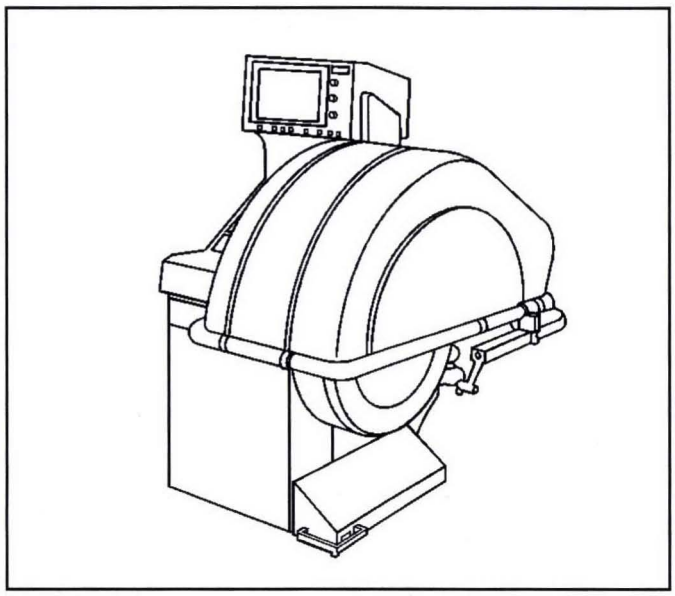
Tire and wheel balancers can drift out of calibration over time, or can become inaccurate as a result of heavy use. There will likely not be any visual evidence that a calibration problem exists. If a balancer is not calibrated within specifications, and a tire and wheel assembly is balanced on that machine, the assembly may actually be imbalanced.

Tire and wheel assembly balancer calibration should be checked approximately every 2 weeks, if the machine is used frequently, and/or whenever the balance readings are questionable.

Tire and Wheel Assembly Balancer Calibration Test

Note: If the balancer fails any of the steps in this calibration test, the balancer should be calibrated according to the manufacturer's instructions. If the balancer cannot be calibrated, contact the manufacturer for assistance.

Inspect the calibration of the tire and wheel assembly balancer according to the manufacturer's recommendations, or perform the following test.



612344

1. Spin the balancer without a wheel or any of the adapters on the shaft.
2. Inspect the balancer readings.

   Specification

   Zero within 7 g (¼ oz)
3. If the balancer is within the specification range, balance a tire and wheel assembly – that is within radial and lateral runout tolerances – to ZERO, using the same balancer.
4. After the tire and wheel assembly has been balanced, add an 85 g (3 oz) test weight to the wheel at any location.
5. Spin the tire and wheel assembly again. Note the readings.
   - In the static and dynamic modes, the balancer should call for 85 g (3 oz) of weight, 180 degrees opposite the test weight.
   - In the dynamic mode, the weight should be called for on the flange of the wheel opposite the test weight.
6. With the assembly imbalanced to 85 g (3 oz), cycle the balancer 5 times.
7. Inspect the balancer readings:

   Specification

   Maximum variation: 7 g (¼ oz)
8. Index the tire and wheel assembly on the balancer shaft, 90 degrees from the previous location.
9. Cycle the balancer with the assembly at the new location.
10. Inspect the balancer readings:

    Specification

    Maximum variation: 7 g (¼ oz)
11. Repeat steps 8 through 10 until the tire and wheel assembly has been cycled and checked at each of the 4 locations on the balancer shaft.

Tire and Wheel Assembly Balancing Guidelines

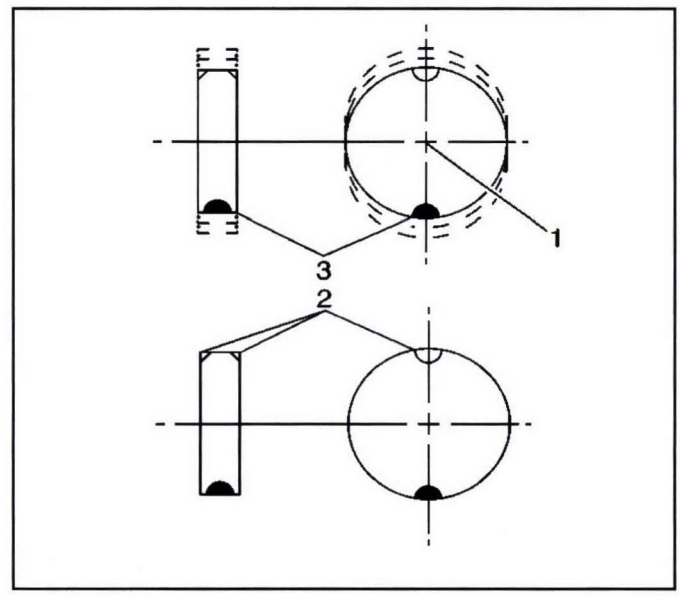
Note: Tire and wheel assemblies which exhibit excessive runout can produce vibrations even if the assemblies are balanced.

It is strongly recommended that the tire and wheel assembly runout be measured and corrected if necessary BEFORE the assemblies are balanced.

If the runout of the tire and wheel assemblies has not yet been measured, refer to *Tire and Wheel Assembly Runout Measurement - Off Vehicle on page 1-54* before proceeding.

There are 2 types of tire and wheel balance:

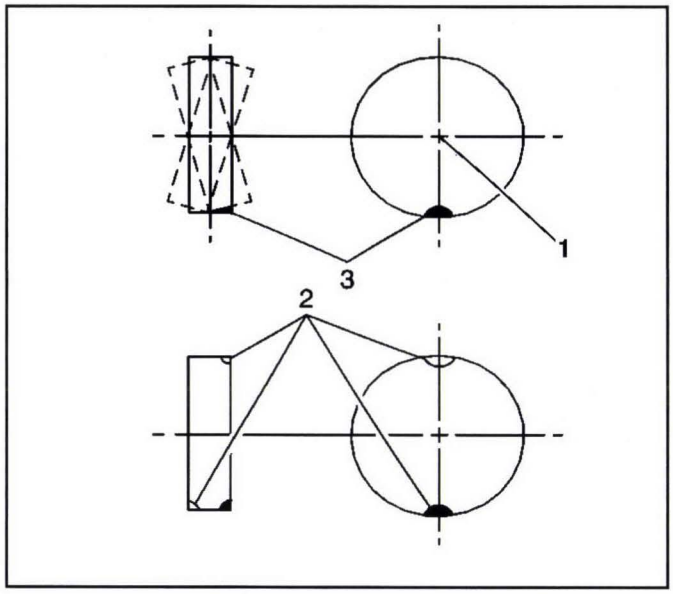
Static Balance



70074

Static balance is the equal distribution of weight around the wheel circumference. The wheel balance weights (2) are positioned on the wheel in order to offset the effects of a heavy spot (3). Wheels that have static imbalance can produce a bouncing action called tramp.

Dynamic Balance



70079

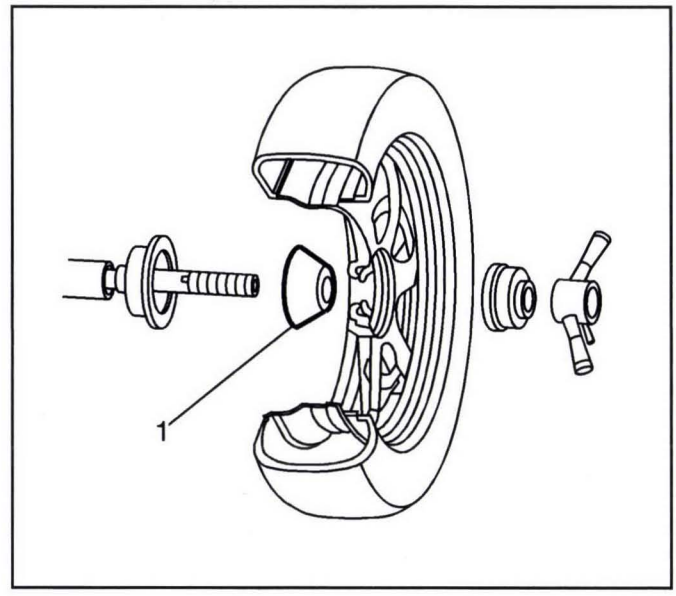
Dynamic balance is the equal distribution of weight on each side of the tire and wheel assembly centerline. The wheel balance weights (2) are positioned on the wheel in order to offset the effects of a heavy spot (3). Wheels that have dynamic imbalance have a tendency to move from side to side and can cause an action called shimmy.

Most off-vehicle balancers are capable of checking both types of balance simultaneously.

As a general rule, most vehicles are more sensitive to static imbalance than to dynamic imbalance; however, vehicles equipped with low profile, wide tread path, high performance tires and wheels are susceptible to small amounts of dynamic imbalance. As little as 14–21 g (½–¾ oz) imbalance is capable of inducing a vibration in some vehicle models.

Balancing Procedure

Note: When balancing tire and wheel assemblies, use a known good, recently calibrated, off-vehicle, two-plane dynamic balancer set to the finest balance mode available.



3018691

Note: Carefully follow the wheel balancer manufacturers's instructions for proper mounting of the center cone (1).

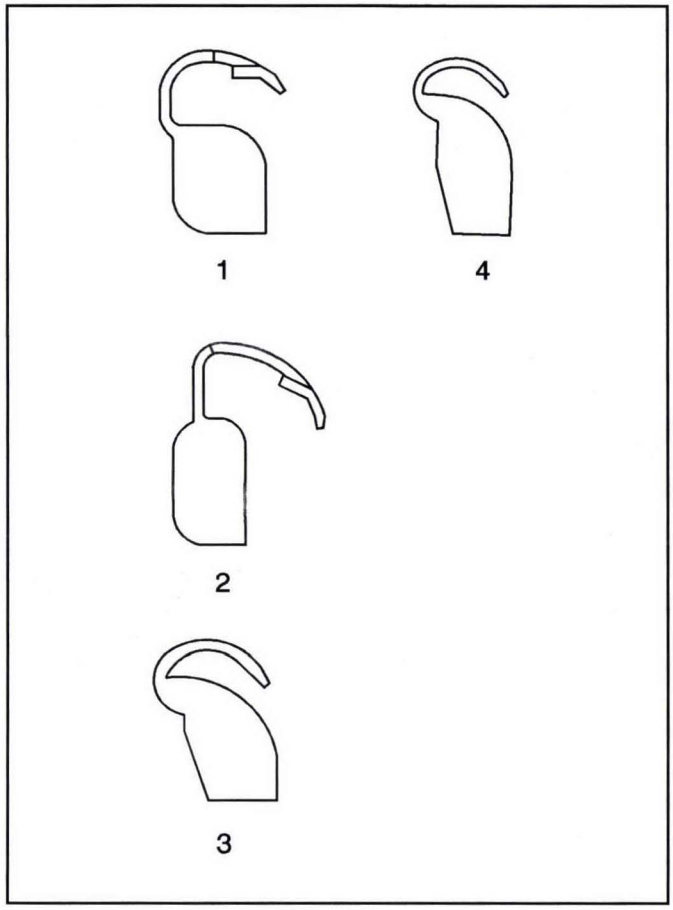
1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*.
2. Mark the location of the wheels to the wheel studs and mark the specific vehicle position on each tire and wheel – LF, LR, RF, RR.
3. Remove the tire and wheel assemblies one at a time and mount on a spin-type wheel balancer. Refer to *Tire and Wheel Removal and Installation on page 15-51*.
4. Carefully follow the wheel balancer manufacturer's instructions for proper mounting techniques to be used on different types of wheels.

   Regard aftermarket wheels, especially those incorporating universal lug patterns, as potential sources of runout and mounting concerns.
5. Be sure to use the correct type of wheel balance weights for the type of wheel rim being balanced. Be sure to use the correct type of coated wheel balance weights on aluminum wheels. Refer to Wheel Weight Usage.
6. Balance all four tire and wheel assemblies as close to zero as possible.
7. Using the matchmarks made prior to removal, install the tire and wheel assemblies to the vehicle. Refer to *Tire and Wheel Removal and Installation on page 15-51*.
8. Lower the vehicle.

Wheel Weight Usage

Tire and wheel assemblies can be balanced using either the static or dynamic method.

Clip-on Weights

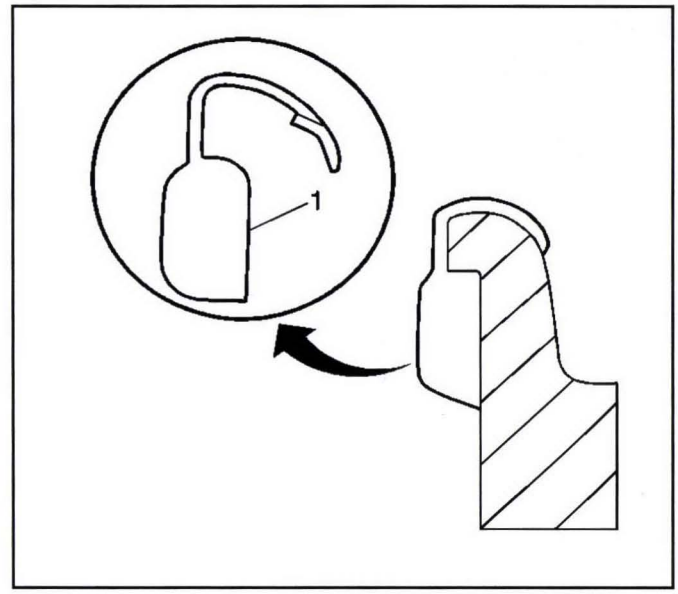


448750

Note: When balancing factory aluminum wheels with clip-on wheel balance weights, be sure to use special polyester-coated weights. These coated weights reduce the potential for corrosion and damage to aluminum wheels.

These coated weights reduce the potential for corrosion and damage to aluminum wheels.

- MC (1) and AW (2) series weights are approved for use on aluminum wheels.
- P (3) series weights are approved for use on steel wheels only.
- T (4) series coated weights are approved for use on both steel and aluminum wheels.

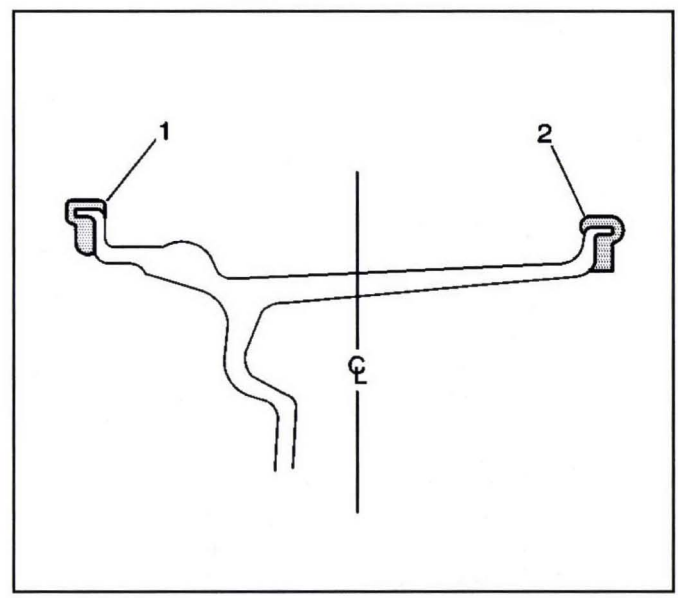


315790

Note: Use a nylon or plastic-tipped hammer when installing coated clip-on wheel balance weights to minimize the possibility of damage to the polyester coating.

The contour and style of the wheel rim flange will determine which type of clip-on wheel weight (1) should be used. The weight should follow the contour of the rim flange. The weight clip should firmly grip the rim flange.

Wheel Weight Placement – Clip-on Weights

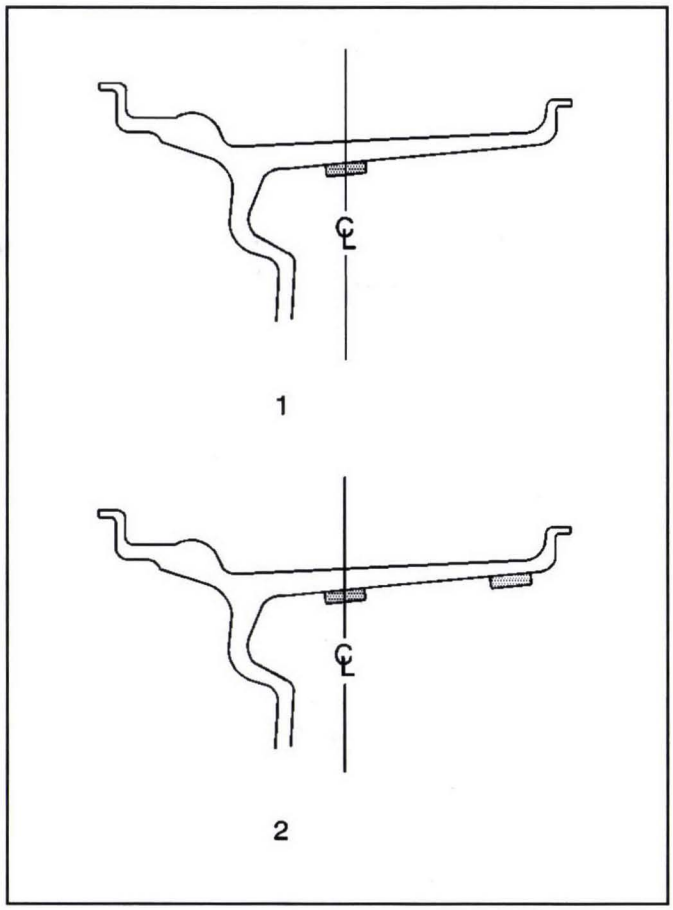


448749

When static balancing, locate the wheel balance weights on the inboard flange (2) if only 28 g (1 oz) or less is called for. If more than 28 g (1 oz) is called for, split the weights as equally as possible between the inboard (2) and outboard (1) flanges.

When dynamic balancing, locate the wheel balance weights on the inboard (2) and outboard (1) rim flanges at the positions specified by the wheel balancer.

Adhesive Weights



448752

Note: When installing adhesive balance weights on flangeless wheels, do NOT install the weight on the outboard surface of the rim.

Adhesive wheel balance weights may be used on factory aluminum wheels. Perform the following procedure to install adhesive wheel balance weights.

1. Determine the correct areas for placement of the wheel weights on the wheel.
   - When static balancing, locate the wheel balance weights along the wheel centerline (1) on the inner wheel surface if only 28 g (1 oz) or less is called for. If more than 28 g (1 oz) is called for, split the weights as equally as possible between the wheel centerline and the inboard edge of the inner wheel surface (2).
   - When dynamic balancing, locate the wheel balance weights along the wheel centerline and the inboard edge of the inner wheel surface (2) at the positions specified by the wheel balancer.
2. Ensure that there is sufficient clearance between the wheel weights and brake system components.

   Note: Do not use abrasives to clean any surface of the wheel.
3. Using a clean cloth or paper towel with a general purpose cleaner, thoroughly clean the designated balance weight attachment areas of any corrosion, overspray, dirt or any other foreign material.
4. To ensure there is no remaining residue, wipe the balance weight attachment areas again, using a clean cloth or paper towel with a mixture of half isopropyl alcohol and half water.
5. Dry the attachment areas with hot air until the wheel surface is warm to the touch.
6. Warm the adhesive backing on the wheel balance weights to room temperature.
7. Remove the protective covering from the adhesive backing on the back of the balance weights. DO NOT touch the adhesive surface.
8. Apply the wheel balance weights to the wheel, press into place with hand pressure.
9. Secure the wheel balance weights to the wheel with a 90 N (21 lb) force applied with a roller.

Description and Operation

General Description

The factory installed tires are designed to operate satisfactorily with loads up to and including the full rated load capacity when these tires are inflated to the recommended pressures.

The following factors have an important influence on tire life:

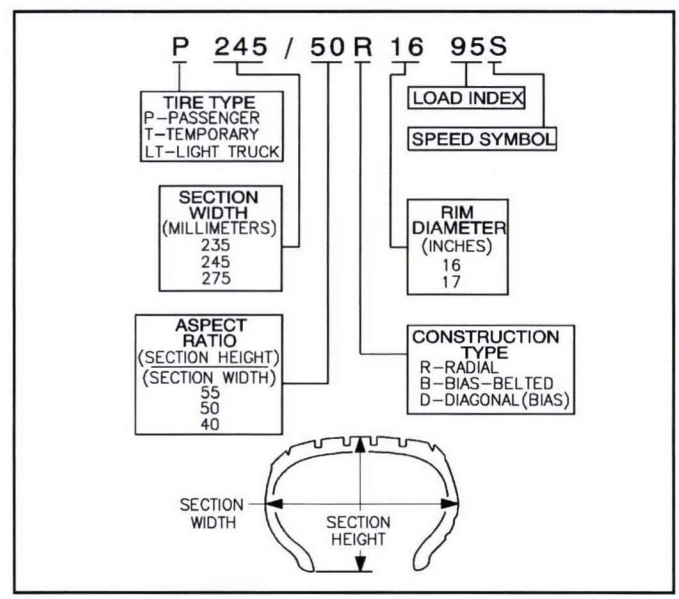
- Correct tire pressures
- Correct wheel alignment
- Proper driving techniques
- Tire rotation

The following factors increase tire wear:

- Heavy cornering
- Excessively rapid acceleration
- Heavy braking

P-Metric Sized Tires Description

The tire sidewall has a coded marking system, which provides information about the tire.



2327362

Tire Marking Example:		
P 245 50 R 16 95 S		
P	Passenger Vehicle Designation	
245	Section Width in mm (245 mm)	
50	Aspect Ratio% (Section Height to Section Width) (50= 50%)	
R	Tire Construction (R= Radial)	
16	Rim Diameter in inches (16= 16")	
95	Max Load Index	91= 615 kg
		92= 630 kg
		93= 650 kg
		94= 670 kg
		95= 690 kg
		96= 710 kg
		97= 730 kg
		99= 775 kg
		104= 900 kg
		106= 950 kg
S	Speed Rating	R = 170 km/h
		S = 180 km/h
		H = 210 km/h
		V = 240 km/h
		W = 270 km/h

Most P-metric tire sizes do not have exact corresponding alphanumeric tire sizes. Replacement tires should be of the same tire performance criteria TPC specification number including the same size, the same load range, and the same construction as those originally installed on the vehicle.

Consult a tire dealer if you must replace the P-metric tire with other sizes. Tire companies can best recommend the closest match of alphanumeric to P-metric sizes within their own tire lines.

The above illustration may not correspond with your vehicle, but is meant as an example.

Replacement Wheels Description

Replace the wheel if any of the following conditions exist:

- The wheel exhibits excessive runout.
- The wheel is bent.
- The wheel is cracked.
- The wheel is severely rusted.
- The wheel is severely corroded.

  Note: Air leaks caused by porosity on aluminum wheels are repairable.
- The wheel leaks air.

Warning: If you are replacing the wheel(s), the wheel stud(s), the wheel nut(s) or the wheel bolt(s), install only new GM original equipment parts. Installation of used parts or non-GM original equipment parts may cause the wheel to loosen, loss of tire air pressure, poor vehicle handling and loss of vehicle control resulting in personal injury.

Caution: The use of non-GM original equipment wheels may cause:

- Damage to the wheel bearing, the wheel fasteners and the wheel
- Tire damage caused by the modified clearance to the adjacent vehicle components
- Adverse vehicle steering stability caused by the modified scrub radius
- Damage to the vehicle caused by the modified ground clearance
- Speedometer and odometer inaccuracy

Replace the wheel, the wheel studs and the wheel nuts, if any of the following conditions exist:

- The wheel has elongated wheel stud holes.
- The wheel nuts loosen repeatedly.

Tire Inflation Description

This vehicle has been engineered to operate up to the stated load capacity with wheel and tire assemblies of the type, size, construction, and configuration as originally installed. Maintenance of the tire inflation pressures is critical to the continued satisfactory performance, handling, and operating economy of the vehicle.

Operating the vehicle with improperly inflated tires can adversely affect vehicle performance and may contribute to the following:

- Reduced fuel economy
- Tire overloading
- Shortened tire life
- Excessive tire wear
- Uneven tire wear
- Vehicle handling concerns

Inspect the tire pressures when the vehicle has not been driven for at least 3 hours or not more than 1.6 km (1 mi) and when the tires are cool to the touch.

Tire inflation pressures should be inspected monthly and before an extended trip and adjusted to meet the specifications listed for the particular vehicle. Replace any missing or damaged tire valve stem extensions and/or caps to prevent the intrusion of water and contaminates.

One pound per square inch (psi) equals 6.9 kilopascals (kPa). The following table illustrates the conversion of kilopascals to pounds per square inch:

Inflation Pressure Conversion (Kilopascals to PSI)

kPa	psi	kPa	psi
140	20	215	31
145	21	220	32
155	22	230	33

Inflation Pressure Conversion (Kilopascals to PSI) (cont'd)

kPa	psi	kPa	psi
160	23	235	34
165	24	240	35
170	25	250	36
180	26	275	40
185	27	310	45
190	28	345	50
200	29	380	55
205	30	415	60
Conversion: 6.9 kPa = 1 psi			

For the correct inflation pressures refer to the vehicle Tire Placard.

Tires inflated to a higher than recommended pressure can contribute to the following conditions:

- A hard ride
- Tire bruising
- Rapid tread wear at the center of the tire

Tires inflated to a lower than recommended pressure can contribute to the following conditions:

- Tire squeal on turns
- Hard steering
- Rapid and/or uneven wear on the outer edges of the tread
- Tire rim bruises and tire rim rupture
- Tire cord breakage
- High tire temperatures
- Sluggish vehicle handling
- Higher fuel consumption

Unequal pressure on the same axle can cause the following conditions:

- Uneven braking action
- Steering lead
- Imprecise vehicle handling

Wheel Alignment

Specifications

Wheel Alignment Specifications

Wheels	Camber (Left / Right)	Camber Cross Tolerance	Caster (Left / Right)	Caster Cross Tolerance	Total Toe (Left + Right)	Steering Wheel Angle	Thrust Angle (Left - Right) / 2
Front	−0.42°±0.75°	±0.75°	3.65°±0.75°	±0.75°	0.04°±0.20°	0.00°±2.50°	—
Rear	−1.00°±0.50°	±0.75°	—	—	0.05°±0.35°	—	0.00°±0.30°

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Tie Rod Jam Nut	75 N•m	55 lb ft

Repair Instructions

Wheel Alignment Measurement

Steering and vibration concerns are not always the result of incorrect alignment. One possible cause is wheel and tire imbalance. Another possibility is tire lead due to worn or improperly manufactured tires. Lead/pull is defined as follows: At a constant highway speed on a typical straight road, lead/pull is the amount of effort required at the steering wheel to maintain the vehicle's straight path. Lead is the vehicle deviation from a straight path on a level road without pressure on the steering wheel. Refer to *Radial Tire Lead/Pull Correction on page 15-50*.

Before performing any adjustments affecting wheel alignment, perform the following inspections in order to ensure correct alignment readings:

- Inspect for visible damage to the suspension components and replace as necessary.
- Inspect the tires for the proper inflation and irregular tire wear. Refer to *Tire Diagnosis - Irregular or Premature Wear on page 15-49*.
- Inspect the runout of the wheels and the tires. Refer to *Tire and Wheel Runout Specifications on page 1-36*.
- Inspect the wheel bearings for backlash and excessive play. Refer to *Wheel Bearings Diagnosis on page 15-34*.
- Inspect the ball joints for looseness or wear.
- Inspect the tie rod ends for looseness or wear.
- Inspect the control arms and stabilizer shaft for looseness or wear.
- Inspect the steering gear for looseness at the frame. Refer to *Fastener Tightening Specifications on page 14-3*.
- Inspect the struts/shock absorbers for wear, leaks, and any noticeable noises. Refer to *Suspension Strut and Shock Absorber Testing - On Vehicle on page 15-34*.
- Inspect the vehicle trim height. Refer to *Trim Height Inspection on page 15-35*.
- Inspect the steering wheel for excessive drag or poor return due to stiff or rusted linkage or suspension components.
- Inspect the fuel level. The fuel tank should be full or the vehicle should have a compensating load added.

Give consideration to excess loads, such as tool boxes, sample cases, etc. If normally carried in the vehicle, these items should remain in the vehicle during alignment adjustments. Give consideration also to the condition of the equipment being used for the alignment. Follow the equipment manufacturer's instructions.

Satisfactory vehicle operation may occur over a wide range of alignment settings. However, if the setting exceeds the service allowable specifications, correct the alignment to the service preferred specifications. Refer to *Wheel Alignment Specifications on page 15-63*.

Perform the following steps in order to measure the front and rear alignment angles:

1. Install the alignment equipment according to the manufacturer's instructions.
2. Jounce the front and the rear bumpers 3 times prior to checking the wheel alignment.
3. Measure the alignment angles and record the readings.

   Note: Record the "Before" and "After" alignment measurements.
4. Adjust alignment angles to vehicle specifications, if necessary. Refer to *Wheel Alignment Specifications on page 15-63*.

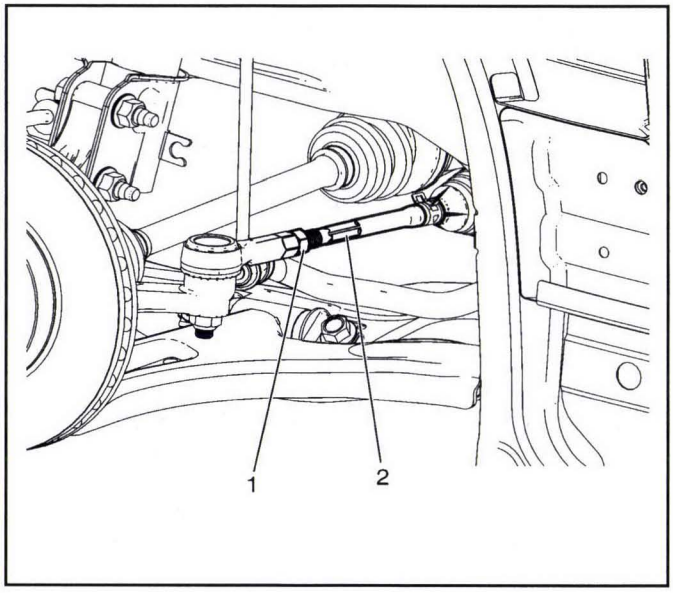
Front Caster Adjustment

The front caster is not adjustable. If the front caster angle is not within specifications, inspect for suspension support misalignment or front suspension damage. Replace any damaged suspension components as necessary.

Front Camber Adjustment

The front camber is not adjustable. If the front camber angle is not within specifications, inspect for suspension support misalignment or front suspension damage. Replace any damaged suspension components as necessary.

Wheel Alignment - Steering Wheel Angle and/or Front Toe Adjustment



2327267

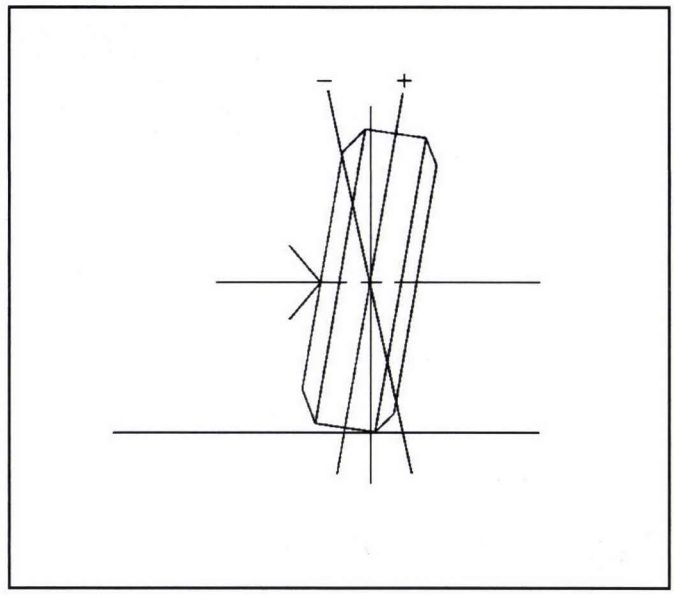
1. Ensure that the steering wheel is set in a straight ahead position and centered.
2. Loosen the tie rod jam nut (1).
3. Adjust the toe to specification by turning the adjuster (2). Refer to *Wheel Alignment Specifications on page 15-63*.

Caution: Refer to *Fastener Caution on page 0-8*.

4. Install the tie rod jam nut (1) and tighten to **75** N•m **(55 lb ft)**.

Description and Operation

Camber Description



2327972

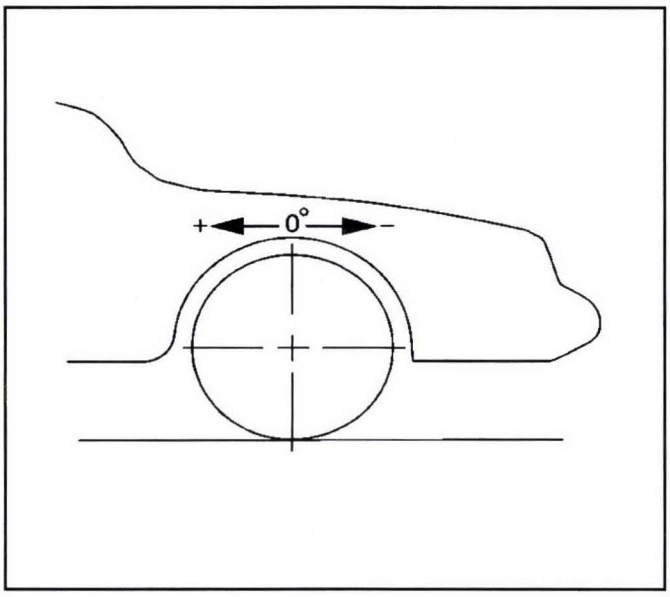
Camber is the tilting of the wheels from the vertical when viewed from the front of the vehicle. When the wheels tilt outward at the top, the camber is positive (+). When the wheel tilts inward at the top, the camber is negative (−). The amount of tilt is measured in degrees from the vertical. Camber settings influence the directional control and the tire wear.

Too much positive camber will result in premature wear on the outside of the tire and cause excessive wear on the suspension parts.

Too much negative camber will result in premature wear on the inside of the tire and cause excessive wear on the suspension parts.

Unequal side-to-side camber of 1 degree or more will cause the vehicle to pull or lead to the side with the most positive camber.

Caster Description



2327973

Caster is the tilting of the uppermost point of the steering axis either forward or backward, when viewed from the side of the vehicle. A backward tilt is positive (+) and a forward tilt is negative (−). Caster influences directional control of the steering but does not affect the tire wear. Caster is affected by the vehicle height, therefore it is important to keep the body at its designed height.

Overloading the vehicle or a weak or sagging rear spring will affect caster. When the rear of the vehicle is lower than its designated trim height, the front suspension moves to a more positive caster. If the rear of the vehicle is higher than its designated trim height, the front suspension moves to a less positive caster.

With too little positive caster, steering may be touchy at high speed and wheel returnability may be diminished when coming out of a turn. If one wheel has more positive caster than the other, that wheel will pull toward the center of the vehicle. This condition will cause the vehicle to pull or lead to the side with the least amount of positive caster.

Lead/Pull Description

Note: Vehicles will tend to lead/pull in the direction of the road slope as part of normal operation.

At a constant highway speed on a typical straight road, lead/pull is the amount of effort required at the steering wheel to maintain the vehicle's straight path.

Lead/pull is usually caused by the following factors:

- Road slope
- Variability in tire construction
- Wheel alignment (front cross caster and camber)
- Unbalanced steering gear

Memory Steer Description

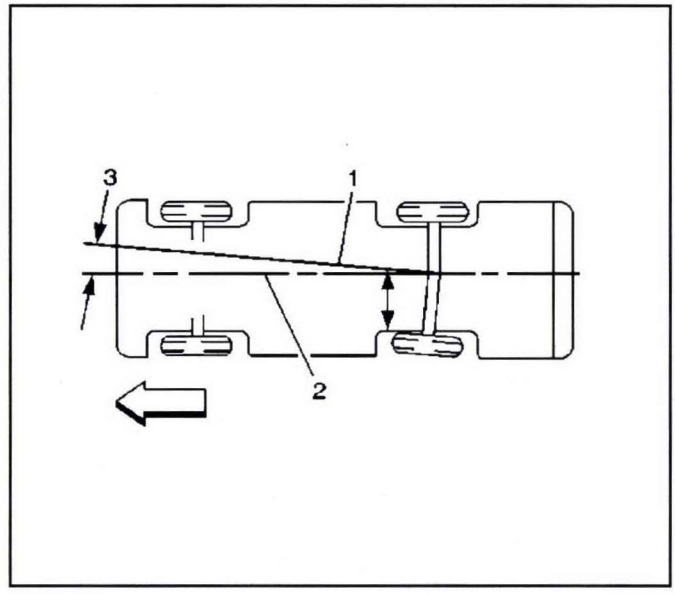
Memory steer is when the vehicle wants to lead or pull in the direction the driver previously turned the vehicle. Additionally, after turning in the opposite direction, the vehicle will want to lead or pull in that direction.

Scrub Radius Description

Ideally, the scrub radius is as small as possible. Normally, the SAI angle and the centerline of the tire and the wheel intersect below the road surface, causing a positive scrub radius. With struts, the SAI angle is much larger than the long arm/short arm type of suspension. This allows the SAI angle to intersect the camber angle above the road surface, forming a negative scrub radius. The smaller the scrub radius, the better the directional stability. Installing aftermarket wheels that have additional offset will dramatically increase the scrub radius. The newly installed wheels may cause the centerline of the tires to move further away from the spindle. This will increase the scrub radius.

A large amount of scrub radius can cause severe shimmy after hitting a bump. Four-wheel drive vehicles with large tires use a steering damper to compensate for an increased scrub radius. Scrub radius is not directly measurable by the conventional methods. Scrub radius is projected geometrically by engineers during the design phase of the suspension.

Thrust Angles Description



2327969

The front wheels aim or steer the vehicle. The rear wheels control tracking. This tracking action relates to the thrust angle (3). The thrust angle is the path that the rear wheels take. Ideally, the thrust angle is geometrically aligned with the body centerline (2).

In the illustration, toe-in is shown on the left rear wheel, moving the thrust line (1) off center. The resulting deviation from the centerline is the thrust angle.

If the thrust angle is not set properly the vehicle may "dog track", the steering wheel may not be centered or it could be perceived as a bent axle. Thrust angle can be checked during a wheel alignment.

Positive thrust angle means the thrust line is pointing to the right hand side (RHS) of the vehicle.

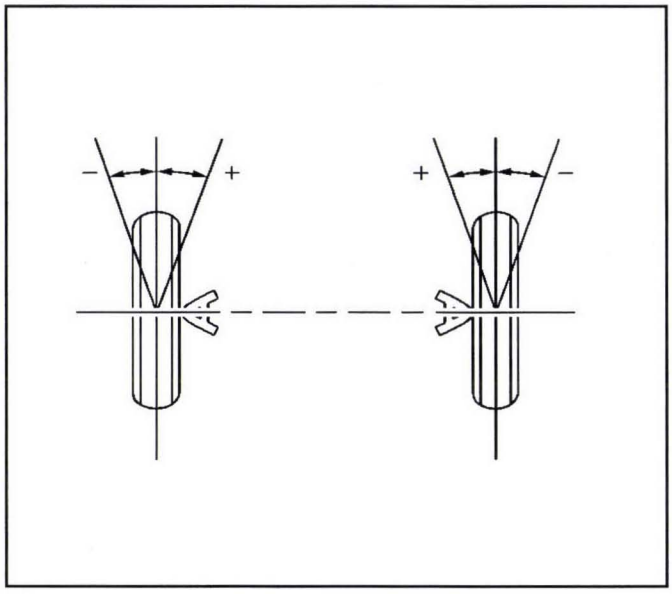
Negative thrust angle means the thrust line is pointing to the left hand side (LHS) of the vehicle.

If the thrust angle is out of specification, moving the axle to body relationship will change the thrust angle reading.

If the vehicle is out in the Positive (+) direction-moving the RHS forward and/or LHS rearward will move the thrust angle towards zero degrees.

If the vehicle is out in the Negative (−) direction-moving the RHS rearward and/or LHS forward will move the thrust angle towards zero degrees.

Toe Description

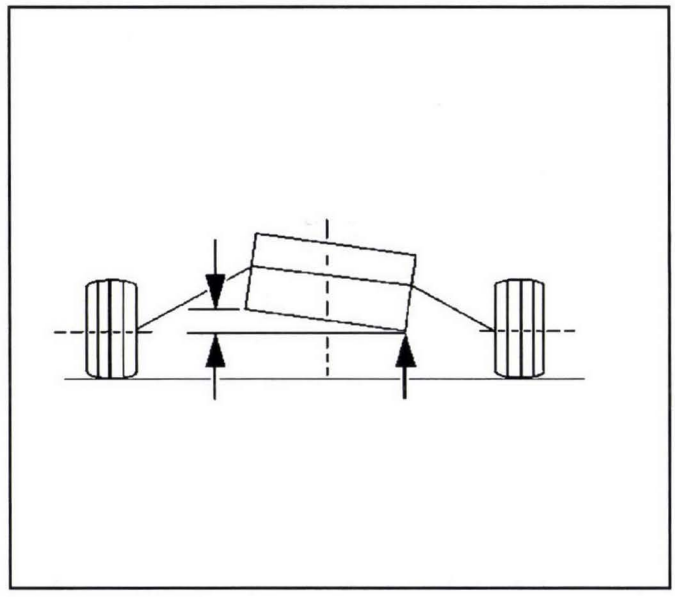


2327971

Toe is a measurement of how much the front and/or rear wheels are turned in or out from a straight-ahead position. When the wheels are turned in, toe is positive (+). When the wheels are turned out, toe is negative (−). The actual amount of toe is normally only a fraction of a degree. The purpose of toe is to ensure that the wheels roll parallel.

Toe also offsets the small deflections of the wheel support system that occur when the vehicle is rolling forward. In other words, with the vehicle standing still and the wheels set with toe-in, the wheels tend to roll parallel on the road when the vehicle is moving. Improper toe adjustment will cause premature tire wear and cause steering instability.

Torque Steer Description



2327967

A vehicle pulls or leads in one direction during hard acceleration. A vehicle pulls or leads in the other direction during deceleration.

The following factors may cause torque steer to be more apparent on a particular vehicle:

- A slightly smaller diameter tire on the right front increases a right torque lead. Inspect the front tires for differences in the brand, the construction, or the size. If the tires appear to be similar, change the front tires from side-to-side and retest the vehicle. Tire and wheel assemblies have the most significant effect on torque steer correction.
- A large difference in the right and left front tire pressure
- Left-to-right differences in the front view axle angle may cause significant steering pull in a vehicle. The pull will be to the side with the most downward sloping axle from the differential to the wheels. Axles typically slope downward from the differential. The slope of the transaxle pan to level ground may be used as an indication of bias axle angles. The side with the higher transaxle pan (shown on the left side of the illustration) has the most downward sloping axle angle.

Wander Description

Wander is the undesired drifting or deviation of a vehicle to either side from a straight path with hand pressure on the steering wheel. Wander is a symptom of the vehicle's sensitivity to external disturbances, such as road crown and crosswind, and accentuated by poor on-center steering feel.

Section 16

Transmission

Automatic Transmission - 1ET35 16-3
Specifications 16-3
Temperature Versus Resistance (Transmission Fluid Temperature Sensor) 16-3
Fastener Tightening Specifications (On Vehicle) 16-4
Fastener Tightening Specifications (Off Vehicle) 16-4
Approximate Fluid Capacities 16-5
Transmission General Specifications 16-5
Adhesives, Fluids, Lubricants, and Sealers 16-5
Transmission Internal Mode Switch Logic 16-5
Schematic and Routing Diagrams 16-6
Automatic Transmission Controls Schematics 16-7
Component Locator 16-8
Disassembled Views 16-8
Component Location 16-14
Bushing, Bearing, and Washer Locations 16-15
Seal Locations 16-16
Diagnostic Information and Procedures 16-18
DTC P0711-P0713 16-18
DTC P1824, P182A-P182F, P1838, or P1839 16-21
DTC P215B 16-24
Symptoms - Automatic Transmission 16-25
Drive Motor Power Inverter Module 3 Phase Cable Inspection 16-25
Transmission Fluid Level and Condition Check 16-28
Road Test 16-29
Automatic Transmission Fluid Leaks 16-30
Coolant/Water in Transmission 16-30
Fluid Leak Diagnosis 16-30
Case Porosity Repair 16-31
Bushing and Mating Shaft Inspection 16-31
Vibration 16-32
Noise and Vibration Analysis 16-32
Whine/Growl Noise That Changes with Vehicle Speed 16-32
Noise in Drive or Reverse Gear 16-32
No Park or Drive 16-32
No Drive in All Ranges 16-33
No Reverse 16-33
Repair Instructions - On Vehicle 16-34
Transmission Control Replacement 16-34
Automatic Transmission Range Selector Lever Replacement 16-35
Range Selector Lever Cable Replacement 16-36
Range Selector Lever Cable Adjustment 16-37
Range Selector Lever Cable Bracket Replacement 16-38
Transmission Fluid Pump Replacement 16-39
Transmission Fluid Pan Replacement 16-40
Fluid Temperature Sensor Replacement 16-41
Transmission Fluid Drain and Fill 16-42
Transmission Fluid Filter Replacement 16-43
Front Wheel Drive Shaft Seal Replacement - Left Side 16-44
Front Wheel Drive Shaft Seal Replacement - Right Side 16-45
Drive Motor Replacement 16-45
Transmission Rear Mount Bracket Replacement 16-50
Transmission Mount Strut Replacement - Rear 16-52
Transmission Mount Replacement - Left Side 16-52
Transmission Mount Replacement - Right Side 16-53
Transmission Replacement 16-54
Repair Instructions - Off Vehicle 16-60
Transmission Fluid Cooler Bypass Valve Removal 16-60
Output Shaft Removal 16-61
Transmission Fluid Pan and Fluid Pump Removal 16-62
Drive Motor Housing Removal 16-63
Main Shaft Removal 16-64
Park Pawl Removal 16-65
Front Differential Carrier Removal 16-66
Shift Shaft Cover Removal 16-67
Manual Shift Shaft Position Switch Removal 16-68
Manual Shift Shaft Seal Removal 16-69
Transmission Control Wiring Harness Removal 16-70
Front Wheel Drive Shaft Oil Seal Removal - Right Side 16-71
Front Wheel Drive Shaft Oil Seal Removal - Left Side 16-72

Transmission Case Cleaning and Inspection 16-73
Transmission Fluid Pump Disassemble 16-74
Transmission Fluid Pump Cleaning and Inspection 16-76
Transmission Fluid Pump Assemble 16-77
Front Wheel Drive Shaft Oil Seal Installation - Left Side 16-79
Front Wheel Drive Shaft Oil Seal Installation - Right Side 16-80
Transmission Control Wiring Harness Installation 16-81
Manual Shift Shaft Position Switch Installation 16-82
Manual Shift Shaft Seal Installation 16-83
Shift Shaft Cover Installation 16-84
Front Differential Carrier Installation 16-85
Park Pawl Installation 16-86
Main Shaft Installation 16-87
Drive Motor Housing Installation 16-88
Transmission Fluid Pan and Fluid Pump Installation 16-89
Output Shaft Installation 16-90
Transmission Fluid Cooler Bypass Valve Installation 16-91
Description and Operation 16-92
Definitions and Abbreviations 16-92
Transmission Identification Information 16-92
Transmission General Description 16-92
Transmission Component and System Description 16-93
Transmission Indicators and Messages 16-93
Electronic Component Description 16-93
Lubrication Description 16-95
Special Tools and Equipment 16-96
Shift Lock Control 16-98
Schematic and Routing Diagrams 16-98
Shift Lock Control Schematics 16-99
Diagnostic Information and Procedures 16-100
DTC B270A 16-100
Symptoms - Automatic Transmission Shift Lock Control 16-102
Transmission Control Lever Malfunction 16-102
Description and Operation 16-103
Automatic Transmission Shift Lock Control Description and Operation 16-103
Transmission Cooling 16-105
Specifications 16-105
Fastener Tightening Specifications 16-105
Diagnostic Information and Procedures 16-105
Transmission Overheats 16-105
Transmission Fluid Cooler Flushing and Flow Test 16-106
Repair Instructions 16-112
Transmission Fluid Auxiliary Cooler Replacement 16-112
Transmission Cooler Bypass Valve Replacement 16-113
Transmission Fluid Cooler Pipe Connector Replacement - Radiator 16-114
Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection 16-115
Transmission Fluid Cooler Inlet Pipe Replacement 16-119
Transmission Fluid Cooler Outlet Pipe Replacement 16-120
Special Tools and Equipment 16-121

Automatic Transmission - 1ET35

Specifications

Temperature Versus Resistance (Transmission Fluid Temperature Sensor)

Temperature	Temperature	Minimum Resistance	Nominal Resistance	Maximum Resistance
°C	°F	Ω	Ω	Ω
−40	−40	95,953	100,865	105,777
−35	−31	69,076	72,437	75,798
−30	−22	50,264	52,594	54,923
−25	−13	36,959	38,583	40,207
−20	−4	27,439	28,582	29,725
−15	5	20,559	21,371	22,183
−10	14	15,540	16,120	16,700
−5	23	11,844	12,261	12,678
0	32	9,097	9,399	9,701
5	41	7,041	7,263	7,485
10	50	5,493	5,658	5,823
15	59	4,318	4,441	4,564
20	68	3,418	3,511	3,604
25	77	2,725	2,795	2,865
30	86	2,185	2,240	2,295
35	95	1,763	1,806	1,849
40	104	1,430	1,465	1,500
45	113	1,167	1,195	1,223
50	122	958	980	1,002
55	131	791	809	827
60	140	656	671	686
65	149	547	559	571
70	158	459	469	479
75	167	387	395	403
80	176	327	334	341
85	185	277	283	289
90	194	236.7	241.8	246.8
95	203	202.5	207.1	211.6
100	212	173.8	178.0	182.1
105	221	149.9	153.6	157.3
110	230	129.7	133.1	136.5
115	239	112.7	115.7	118.7
120	248	98.2	100.9	103.6
125	257	85.9	88.3	90.7
130	266	75.3	77.5	79.6
135	275	66.4	68.3	70.2
140	284	58.6	60.3	62.0
145	293	51.9	53.4	56.2
150	302	46.1	47.5	48.9

Fastener Tightening Specifications (On Vehicle)

Application	Specification	
	Metric	English
3-Phase Cable Assembly Cover Bolts	9 N•m	80 lb in
Air Conditioning Compressor Bracket Bolt	22 N•m	16 lb ft
Automatic Transmission Range Selector Lever Nut	30 N•m	22 lb ft
Cooler Inlet Pipe Mounting Bolt	30 N•m	22 lb ft
Cooler Outlet Pipe Mounting Bolt	23 N•m	17 lb ft
Drive Motor Power Inverter Module Connector Bolts	9 N•m	80 lb in
Drive Motor to Transmission Bolts	9 N•m	80 lb in
Fluid Cooler Bypass Valve Bolt	22 N•m	16 lb ft
Fluid Pan Bolt	9 N•m	80 lb in
Fluid Pump Bolt	9 N•m	80 lb in
Ground Cable Bolt	40 N•m	30 lb ft
High Voltage Cable Connector Bolt	9 N•m	80 lb in
High Voltage Cable Retainer Fasteners	9 N•m	80 lb in
Left Mount to Drive Motor Bolts	65 N•m	48 lb ft
Left Mount Through Bolt	50 N•m Plus 60-75 Degrees	37 lb ft Plus 60-75 Degrees
Range Selector Lever Cable Bracket Bolts	22 N•m	16 lb ft
Rear Mount Bracket to Transmission Bolts	65 N•m	48 lb ft
Rear Mount Strut to Frame Bolts	65 N•m	48 lb ft
Rear Mount Strut Through Bolt	50 N•m Plus 60-75 Degrees	37 lb ft Plus 60-75 Degrees
Right Mount to Transmission Bolts	65 N•m	48 lb ft
Right Mount Through Bolt	50 N•m Plus 60-75 Degrees	37 lb ft Plus 60-75 Degrees
Shift Cable Closeout Panel Fasteners	6 N•m	53 lb in
Shift Cable Retaining Bolt	9 N•m	80 lb in
Trans Level Check Plug	12 N•m	106 lb in
Transmission Control Fasteners	9 N•m	80 lb in

Fastener Tightening Specifications (Off Vehicle)

Application	Ref No.*	Quantity	Size	Specification	
				Metric	English
A/Trans Case Bolt	5	13	M6 x 1.0 x 25	9 N•m	80 lb in
A/Trans Case Hole Plug	34	1	1/8" – 27 NPTF	12 N•m	106 lb in
A/Trans Fluid Filter Bolt	24	1	M6 x 1.0 x 20	9 N•m	80 lb in
A/Trans Fluid Pan Bolt	32	12	M6 x 1.0 x 25	9 N•m	80 lb in
A/Trans Fluid Pump Bolt	28	3	M6 x 1.0 x 85.65	9 N•m	80 lb in
A/Trans Fluid Pump Bolt	217	1	M6 x 1.0 x 45	9 N•m	80 lb in
A/Trans Fluid Pump Bolt	216	3	M6 x 1.0 x 35	9 N•m	80 lb in
A/Trans Manual Shift Shaft Position Switch Bolt	406	1	M5 x 0.8 x 20	8 N•m	71 lb in
Manual Shift Detent Spring Bolt	403	1	M6 x 1.0 x 25.65	9 N•m	80 lb in
Park Pawl Actuator Guide Bolt	413	1	M6 x 1.0 x 25	9 N•m	80 lb in

Fastener Tightening Specifications (Off Vehicle) (cont'd)

Application	Ref No.*	Quantity	Size	Specification	
				Metric	English
Shift Shaft Detent Spring Cover Bolt	400	10	M6 x 1.0 x 25	9 N•m	80 lb in
Transmission Fluid Cooler Thermal Bypass Valve Bolt	20	1	M8 x 1.25 x 65.8	22 N•m	16 lb ft
*Reference number refers to the component callout number in Disassembled Views					

Approximate Fluid Capacities

Application	Specification	
	Metric	English
1ET35		
Drop Pan and Filter – Approximate Capacity	4.2 L	4.4 Qts
Dry Transmission (Empty) – Approximate Capacity	4.2 L	4.4 Qts

Transmission General Specifications

Name	1ET35
RPO Codes	MME
Production Location	Baltimore, MD
Transmission Drive	Front Wheel Drive Transaxle
Reverse	Electrically Variable
EVT Mode	Electrically Variable
Pressure Taps	Line Pressure (Auxiliary Pump)
Transmission Fluid Type	Dexron HP

Transmission General Specifications (cont'd)

Name	1ET35
Transmission Type: Electric	Electrically Variable
Transmission Type: EV	85 kW Drive Motor
Transmission Type: T	Transaxle Mount
Transmission Type: 35	Product Series
Position Quadrant	P, R, N, D, L
Case Material	Die Cast Aluminum
Transmission Net Weight (Wet)	70.3 kg (155 lbs)
Maximum Trailer Towing Capacity	N/A

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number	
		United States	Canada
Automatic Transmission Fluid	Dexron HP	19300536	19300537

Transmission Internal Mode Switch Logic

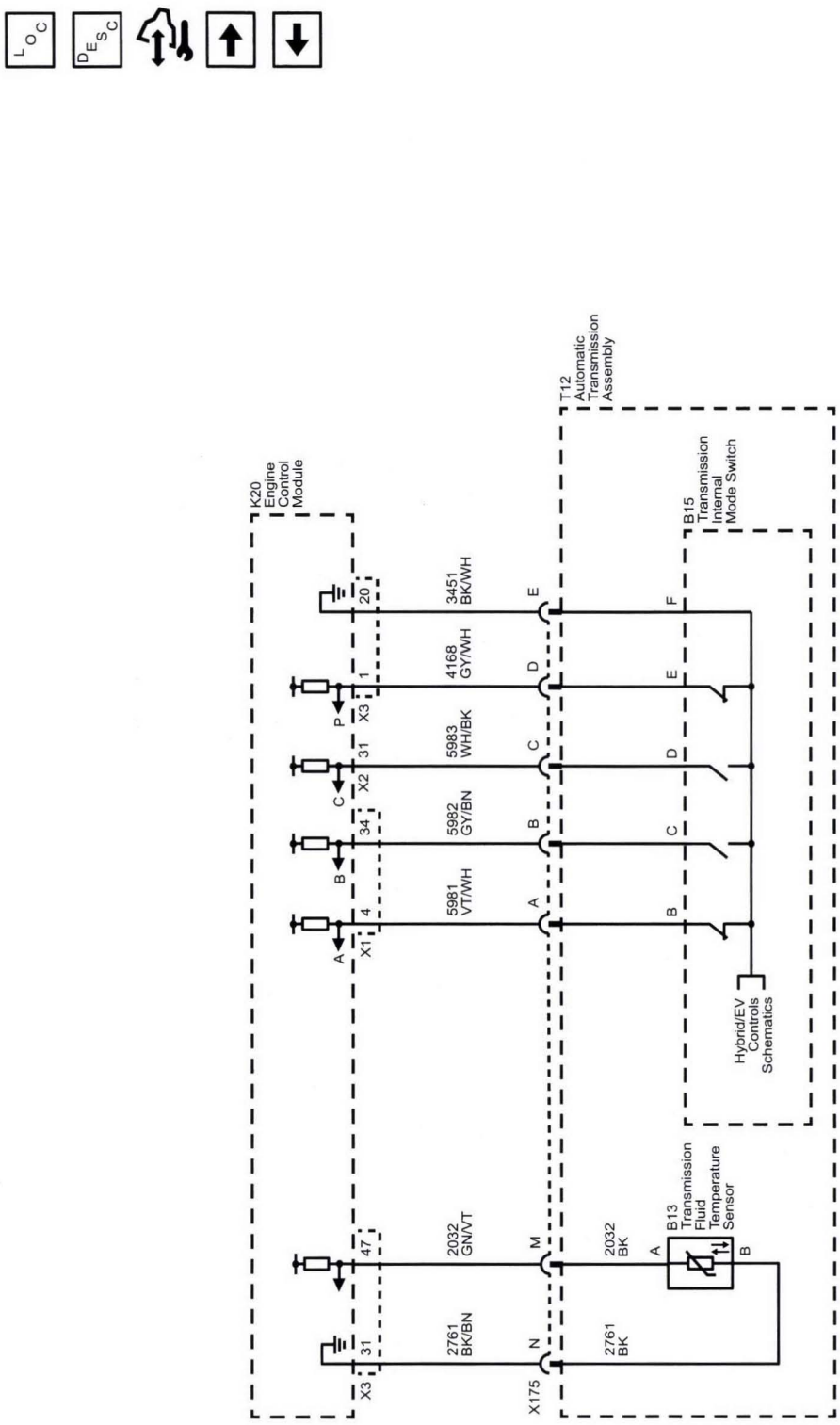
Internal Mode Switch (IMS) IMS Circuits/Parameter	Selector Position			
	Park	Reverse	Neutral	Drive
Direction Switch Operating Conditions: Ignition ON, range selector in appropriate gear				
Direction IMS D1	HIGH	HIGH	LOW	LOW
Direction IMS D2	LOW	LOW	HIGH	HIGH
Direction IMS R1	HIGH	LOW	LOW	HIGH
Direction IMS R2	LOW	HIGH	HIGH	LOW
Direction IMS Start	LOW	HIGH	LOW	HIGH
Range Switch Operating Conditions: Ignition ON, range selector in appropriate gear				
IMS A	LOW	LOW	HI	HI

Transmission Internal Mode Switch Logic (cont'd)

Internal Mode Switch (IMS) IMS Circuits/Parameter	Selector Position			
	Park	Reverse	Neutral	Drive
IMS B	HI	LOW	LOW	LOW
IMS C	HI	HI	HI	LOW
IMS P	LOW	HI	LOW	HI
Always HIGH status: Open/short to voltage condition Always LOW status: Short to ground condition Every status HIGH for either switch indicates an open ground circuit or connector for that portion of the IMS.				

Schematic and Routing Diagrams

Automatic Transmission Controls Schematics (Internal Mode Switch)

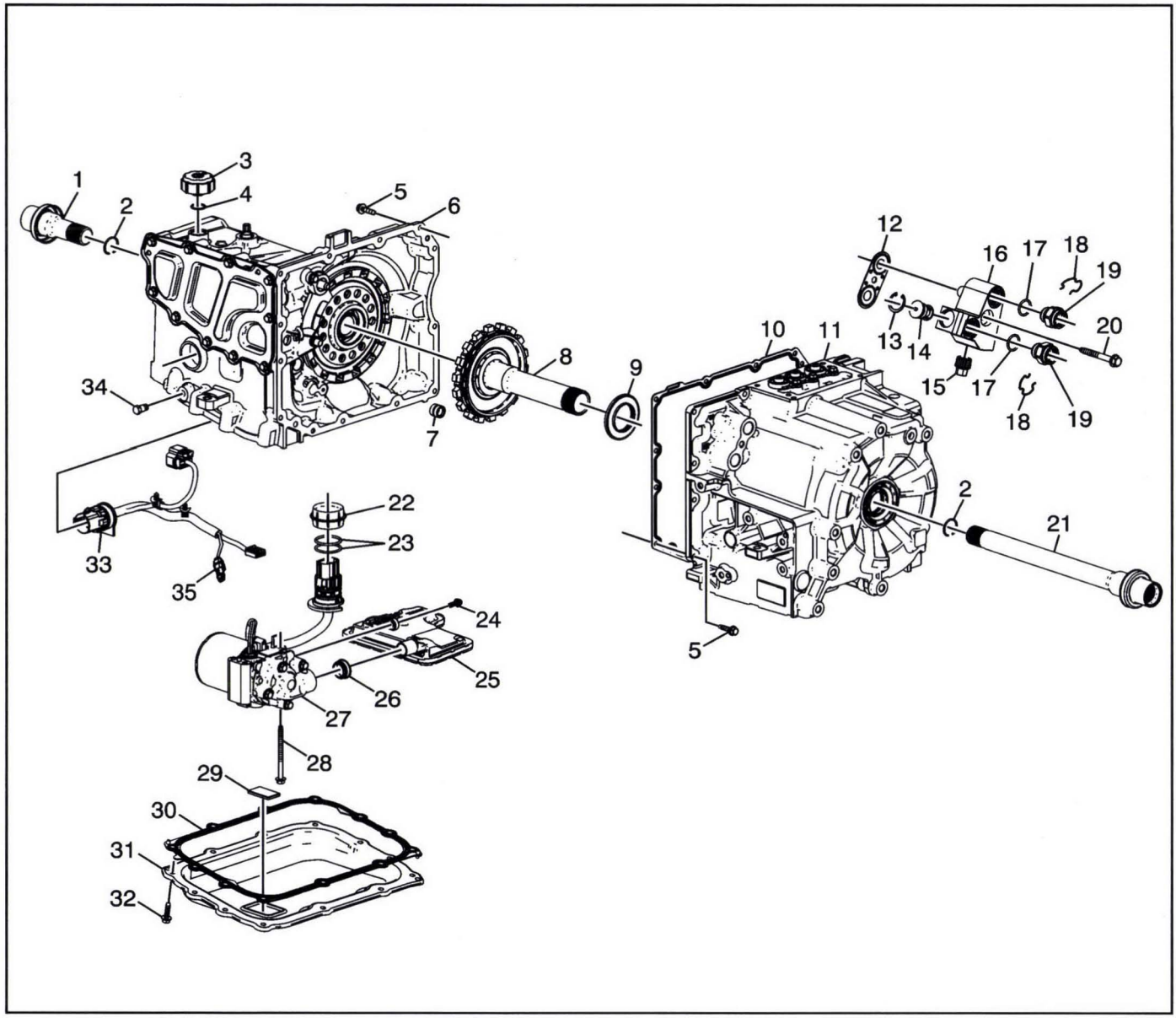


3666300

Component Locator

Disassembled Views

Case and Associated Parts



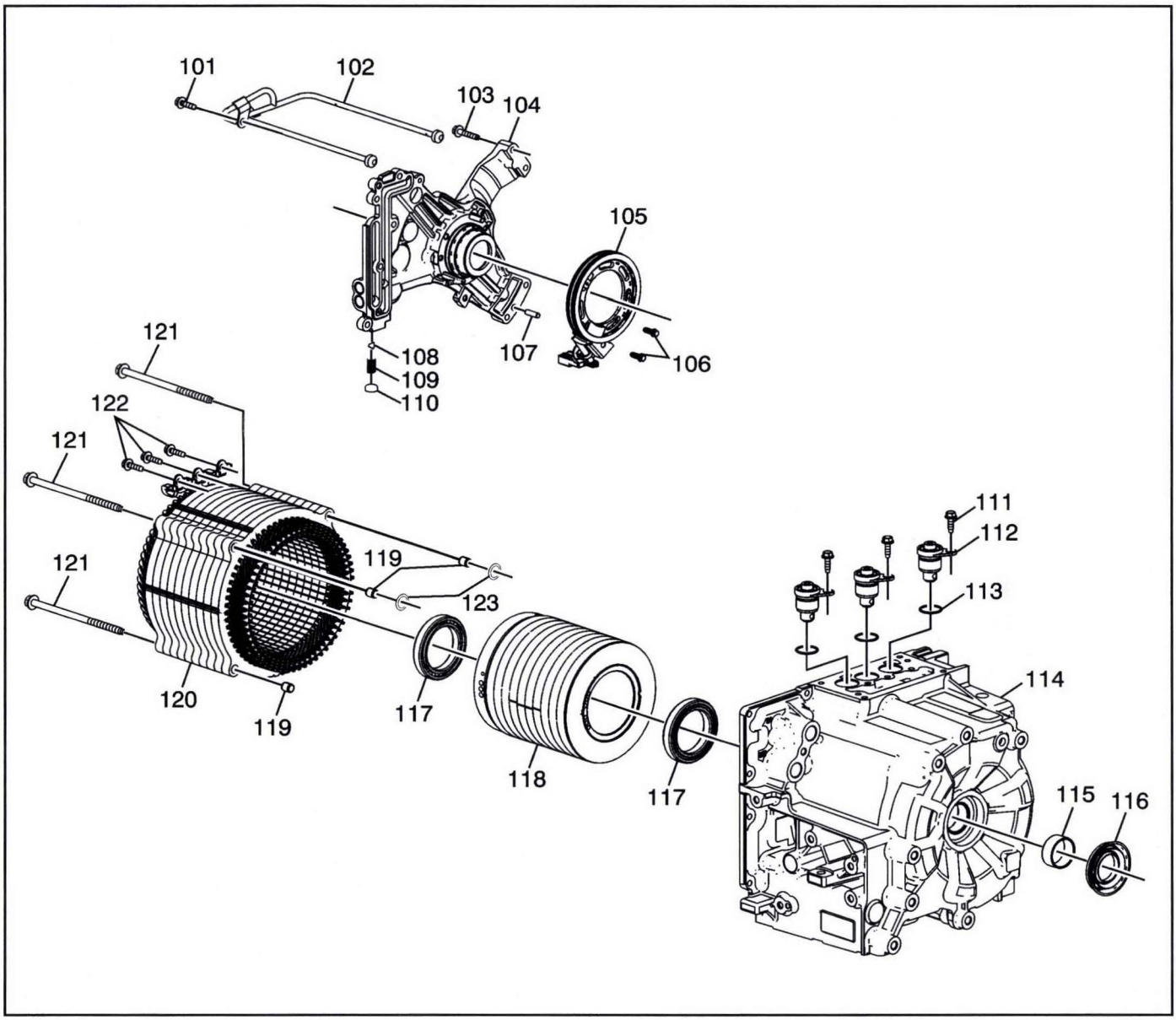
2899077

Legend

(1) Output Shaft Assembly (RHS)
(2) Output Shaft Retaining Ring
(3) Transmission Fluid Fill (with vent) Cap Assembly
(4) Transmission Fluid Fill Cap O-ring Seal
(5) A/Trans Case Bolt (Qty: 13)
(6) A/Trans Case Assembly
(7) A/Trans Case Fluid Passage Seal
(8) Main Shaft
(9) Front Differential Carrier Bearing (LHS)
(10) A/Trans Case Gasket
(11) Drive Motor Assembly
(12) Transmission Fluid Cooler Thermal Bypass Valve Gasket
(13) Thermal Bypass Valve Retainer
(14) Thermal Bypass Valve
(15) Transmission Fluid Cooler Bypass Valve Plug
(16) Transmission Fluid Cooler Bypass Valve
(17) Transmission Fluid Cooler Connector Seal
(18) Transmission Fluid Cooler Pipe Connector Retainers (Qty: 2)
(19) Transmission Fluid Cooler Connector
(20) Transmission Fluid Cooler Thermal Bypass Valve Bolt
(21) Output Shaft Assembly (LHS)

(22) A/Trans Fluid Pump Motor Cable Seal Nut
(23) A/Trans Fluid Pump Motor Cable Seal (Qty: 2)
(24) A/Trans Fluid Filter Bolt
(25) A/Trans Fluid Filter Assembly
(26) A/Trans Fluid Filter Seal
(27) A/Trans Fluid Pump Assembly
(28) A/Trans Fluid Pump Bolt (Qty: 3)
(29) A/Trans Fluid Pan Magnet
(30) A/Trans Fluid Pan Gasket
(31) A/Trans Fluid Pan
(32) A/Trans Fluid Pan Bolt (Qty: 12)
(33) A/Trans Control Wiring Harness Assembly
(34) A/Trans Case Hole Plug
(35) A/Trans Fluid Temp Sensor

Drive Motor Housing Assembly



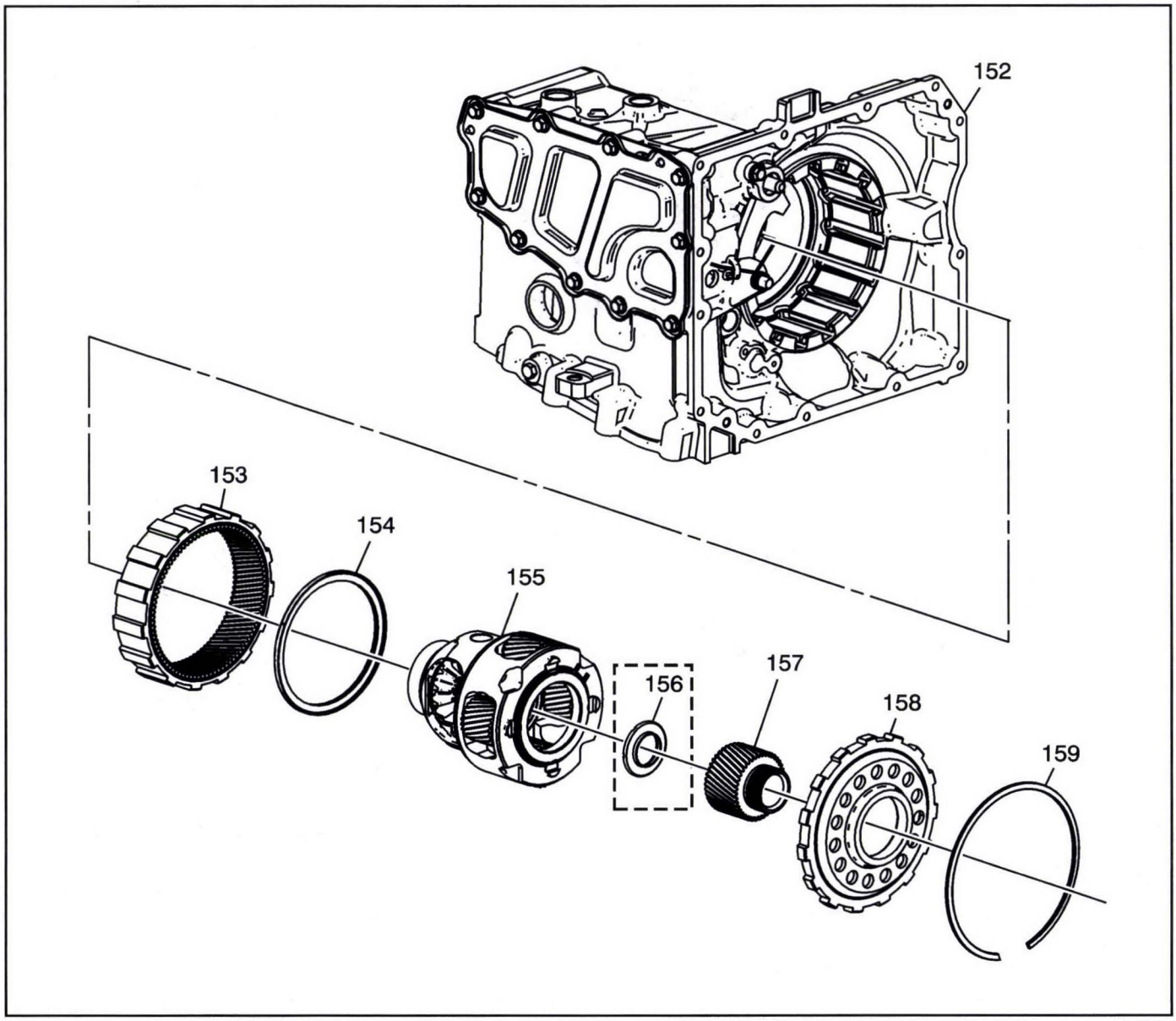
2899082

Legend

(101) A/Trans Case Center Support Bolt (Qty: 6)
(102) Drive Motor Stator Cooling Tube
(103) A/Trans Case Center Support Bolt (Qty: 4)
(104) Center Support Assembly
(105) Drive Motor Position Sensor Assembly
(106) Drive Motor Position Sensor Bolt (Qty: 4)
(107) Transmission Case Center Support Locating Pin (Qty: 2)
(108) Pressure Relief Ball Valve
(109) Pressure Regulator Valve Spring
(110) Pressure Regulator Valve Plug
(111) Drive Motor Power Inverter Module Connector Bolt (Qty: 3)

(112) Drive Motor Power Inverter Module Connector Terminal
(113) Drive Motor Power Inverter Module Connector Seal
(114) Drive Motor Housing Assembly
(115) Front Differential Carrier Bushing
(116) Front Wheel Drive Shaft Oil Seal Assembly (LHS)
(117) Drive Motor Rotor Bearing Assembly
(118) Drive Motor Rotor Assembly
(119) Drive Motor Locating Sleeve (Qty: 4)
(120) Drive Motor Stator Assembly
(121) Drive Motor Bolt (Qty: 4)
(122) Drive Motor Power Inverter Module (3 Phase) Cable Bolt (Qty: 3)
(123) Drive Motor Stator Shim (Selectable) (AR)

Transmission Case Assembly

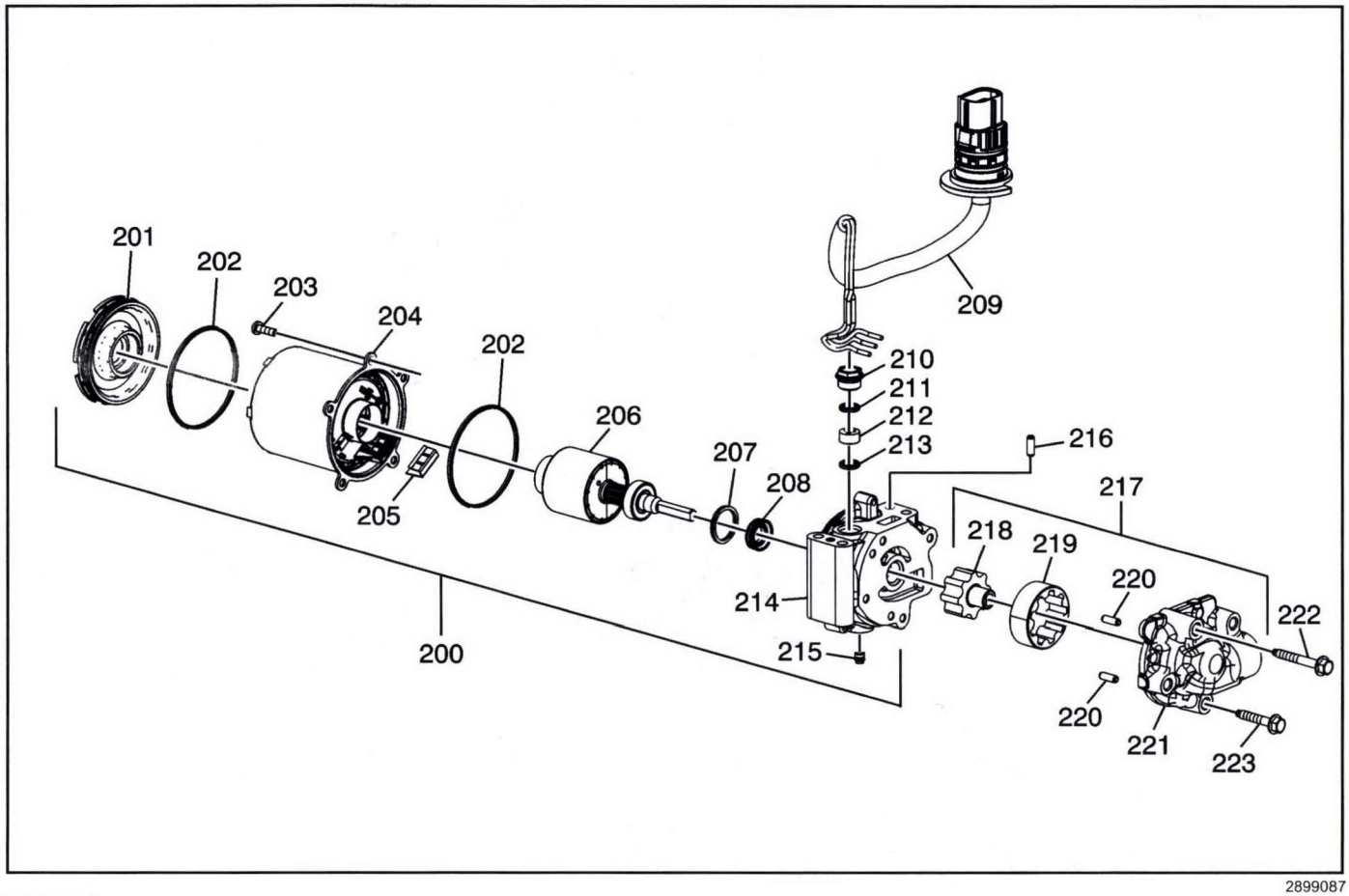


2899084

Legend

(152) A/Trans Case Assembly
(153) Front Differential Ring Gear
(154) Front Differential Carrier Bearing (RHS)
(155) Front Differential Carrier Assembly
(156) Front Differential Carrier Sun Gear Thrust Bearing (Model Dependent)
(157) Front Differential Carrier Sun Gear
(158) Park Gear Hub Assembly
(159) Front Differential Ring Gear Retainer

Fluid Pump Assembly

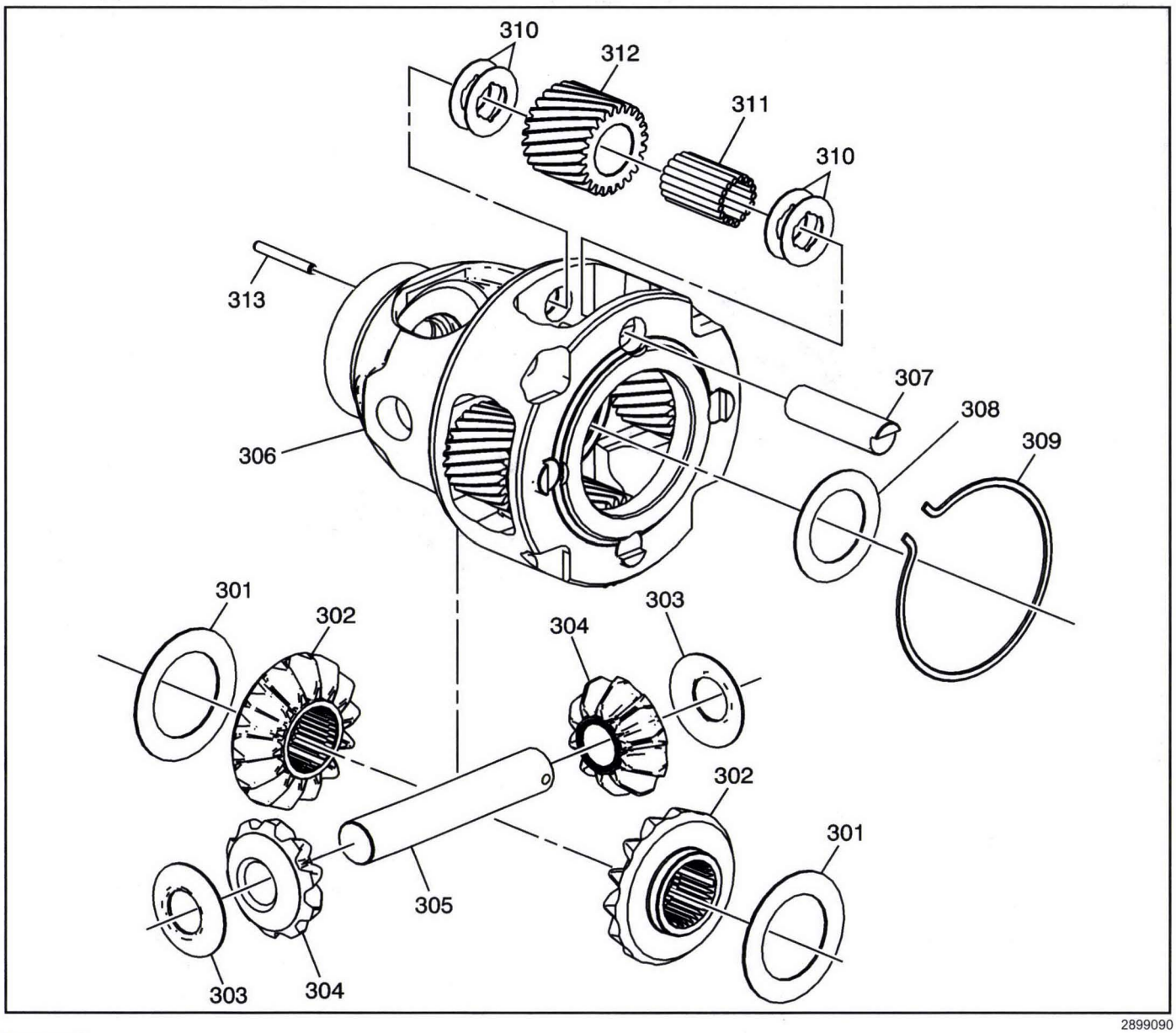


2899087

Legend

(200) A/Trans Auxiliary Fluid Pump Motor Assembly
(201) A/Trans Fluid Pump Motor Cover-Housing
(202) A/Trans Fluid Pump Motor Cover Seal
(203) A/Trans Fluid Pump Motor Cable Bolt (Qty: 5)
(204) A/Trans Fluid Pump Motor Stator Assembly
(205) A/Trans Fluid Pump Motor Cable Connector Cover
(206) A/Trans Fluid Pump Motor Rotor Assembly
(207) A/Trans Fluid Pump Motor Rotor Bearing Washer
(208) A/Trans Fluid Pump Motor Rotor Seal
(209) A/Trans Fluid Pump Motor Cable Assembly
(210) A/Trans Fluid Pump Motor Cable Seal Nut
(211) A/Trans Fluid Pump Motor Cable Seal Washer
(212) A/Trans Fluid Pump Motor Cable Seal
(213) A/Trans Fluid Pump Motor Cable Seal Washer
(214) A/Trans Fluid Pump Motor Cover
(215) A/Trans Fluid Pump Motor Cover Plug
(216) A/Trans Fluid Pump Locating Pin (Qty: 2)
(217) A/Trans Fluid Pump Body Assembly
(218) A/Trans Fluid Pump Drive Gear (Selective)
(219) A/Trans Fluid Pump Driven Gear (Selective)
(220) A/Trans Fluid Pump Body Locating Pin (Qty: 2)
(221) A/Trans Fluid Pump Body
(222) A/Trans Fluid Pump Bolt (Qty: 1)
(223) A/Trans Fluid Pump Bolt (Qty: 3)

Front Differential Carrier Assembly

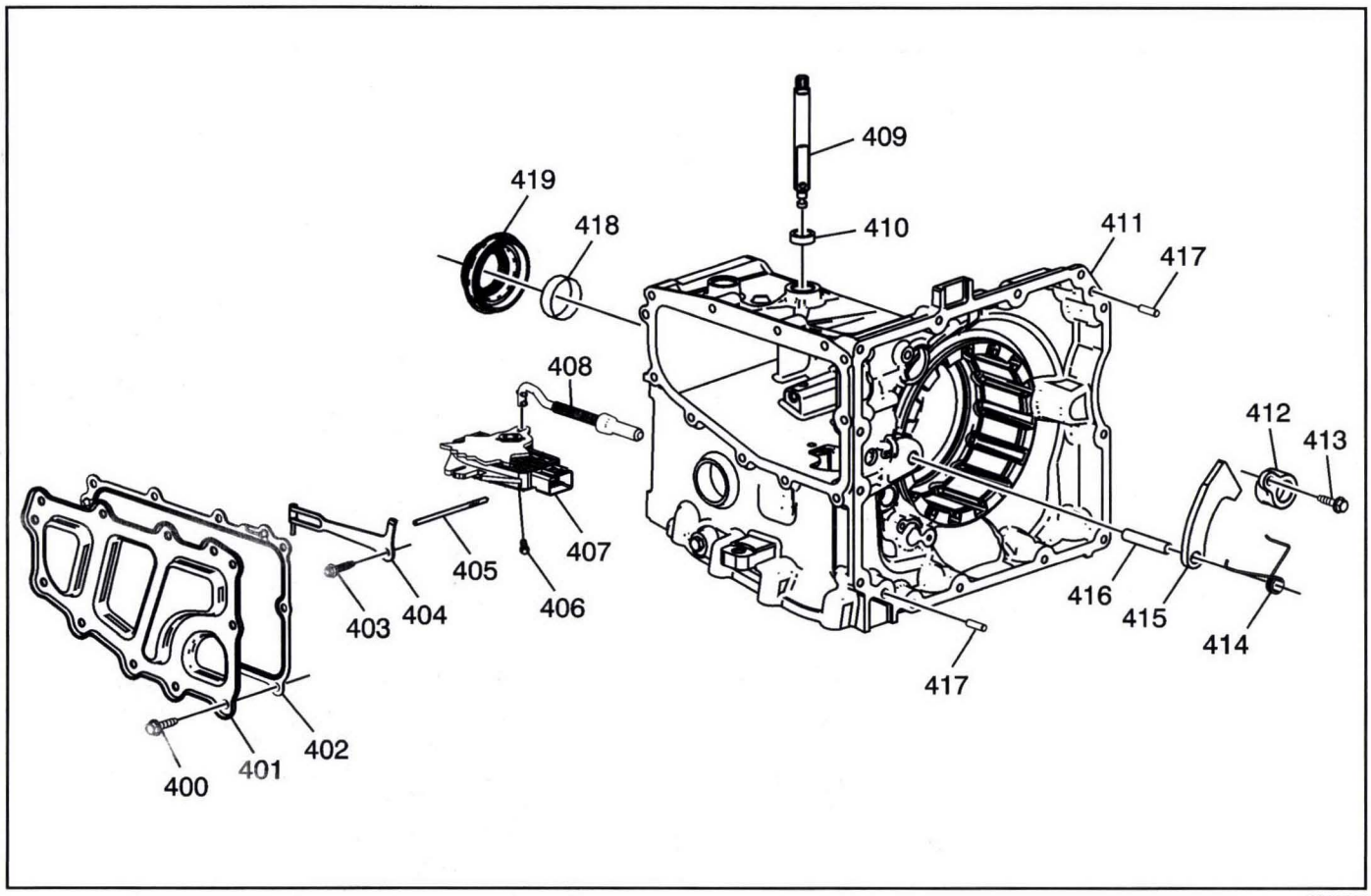


2899090

Legend

(301) Front Differential Side Gear Thrust Washer (Selectable)
(302) Front Differential Side Gear
(303) Front Differential Pinion Gear Thrust Washer
(304) Front Differential Pinion Gear
(305) Front Differential Pinion Gear Shaft
(306) Front Differential Carrier Assembly
(307) Front Differential Pinion Gear Shaft Pin (Qty: 4)
(308) Front Differential Bearing Race
(309) Front Differential Pinion Gear Shaft Retainer
(310) Front Differential Drive Pinion Gear Thrust Washer (Qty: 16)
(311) Front Differential Carrier Planetary Pinion Gear Roller Bearing (Qty: 68)
(312) Front Differential Drive Pinion Gear (Qty: 4)
(313) Front Differential Pinion Gear Shaft Lock Pin

Parking System Components



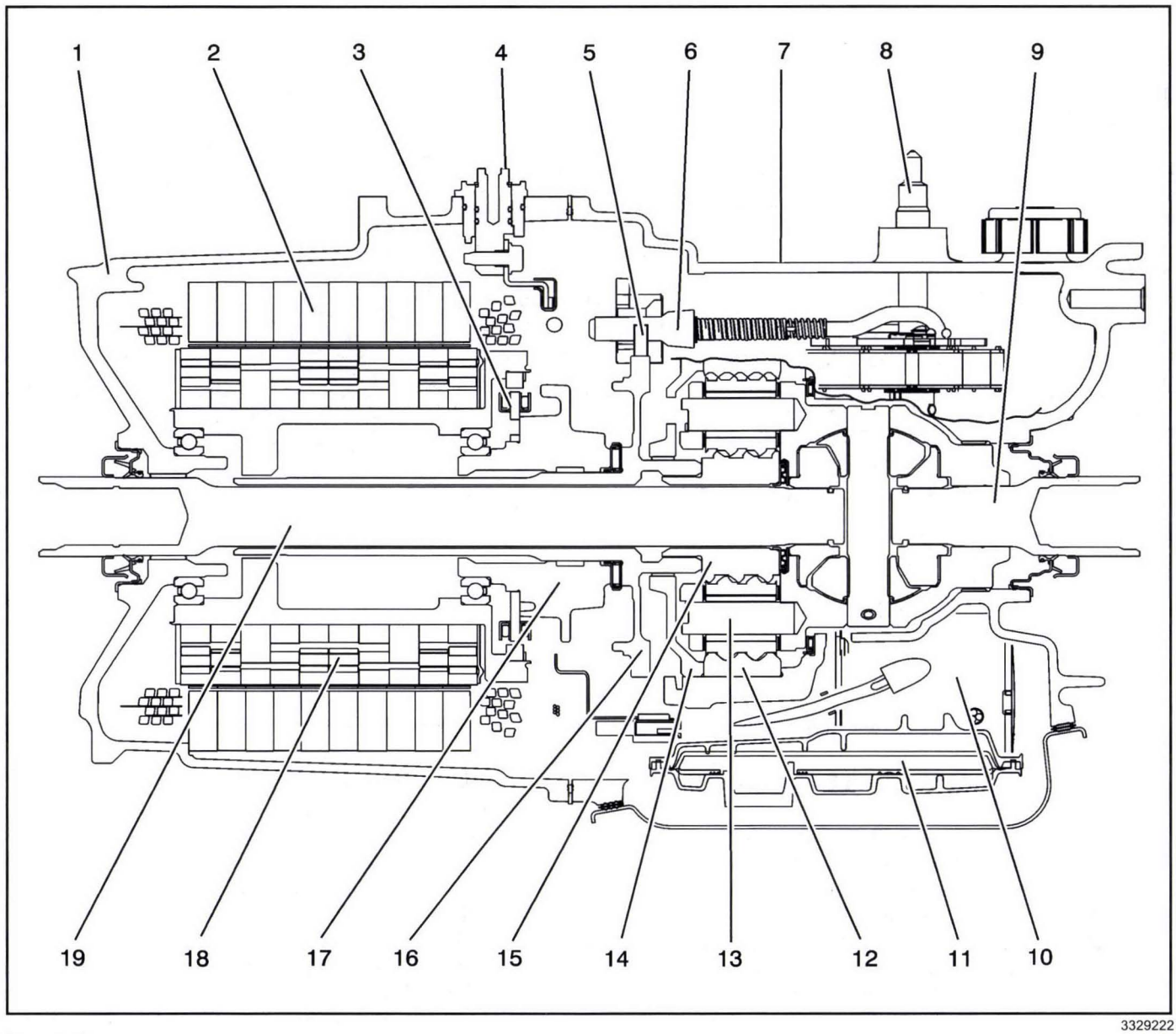
2899092

Legend

(400) Shift Shaft Detent Spring Cover Bolt
(401) Shift Shaft Cover
(402) Shift Control Shaft Cover Gasket
(403) Manual Shift Detent Spring Bolt
(404) Manual Shift Detent Assembly
(405) Manual Shift Shaft Pin
(406) A/Trans Manual Shift Shaft Position Switch Bolt
(407) A/Trans Manual Shift Shaft Position Switch Assembly
(408) Park Pawl Actuator Assembly
(409) Manual Shift Shaft
(410) Manual Shift Shaft Seal
(411) A/Trans Case
(412) Park Pawl Actuator Guide
(413) Park Pawl Actuator Guide Bolt
(414) Park Pawl Spring
(415) Park Pawl
(416) Park Pawl Shaft
(417) Transmission Case Locating Pin (Qty: 2)
(418) Front Differential Carrier Bushing
(419) Front Wheel Drive Shaft Oil Seal Assembly (RHS)

Component Location

Component Location



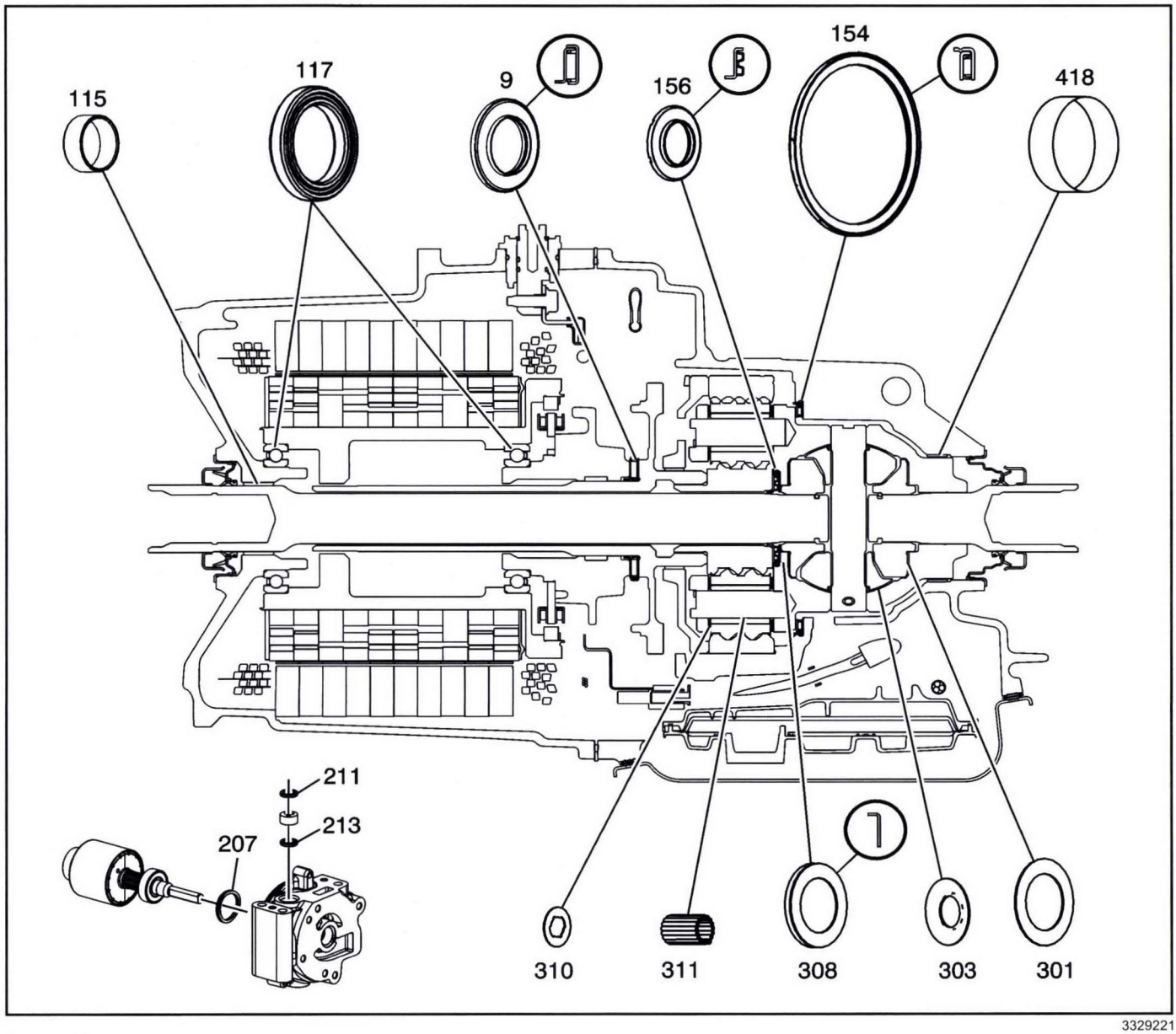
3329222

Legend

(1) Drive Motor Housing
(2) Drive Motor Stator Assembly
(3) Drive Motor Position Sensor Assembly
(4) Drive Motor Power Inverter Module Connector Terminal
(5) Park Pawl
(6) Park Pawl Actuator Assembly
(7) A/Trans Case
(8) Manual Shift Shaft
(9) Output Shaft Assembly (RHS)
(10) A/Trans Fluid Pump Assembly
(11) A/Trans Fluid Filter Assembly
(12) Front Differential Ring Gear
(13) Front Differential Pinion Gear Shaft Pin
(14) Park Gear Hub Assembly
(15) Front Differential Carrier Sun Gear
(16) Main Shaft
(17) Center Support Assembly
(18) Drive Motor Rotor Assembly
(19) Output Shaft Assembly (LHS)

Bushing, Bearing, and Washer Locations

Bushing, Bearing, and Washer Locations



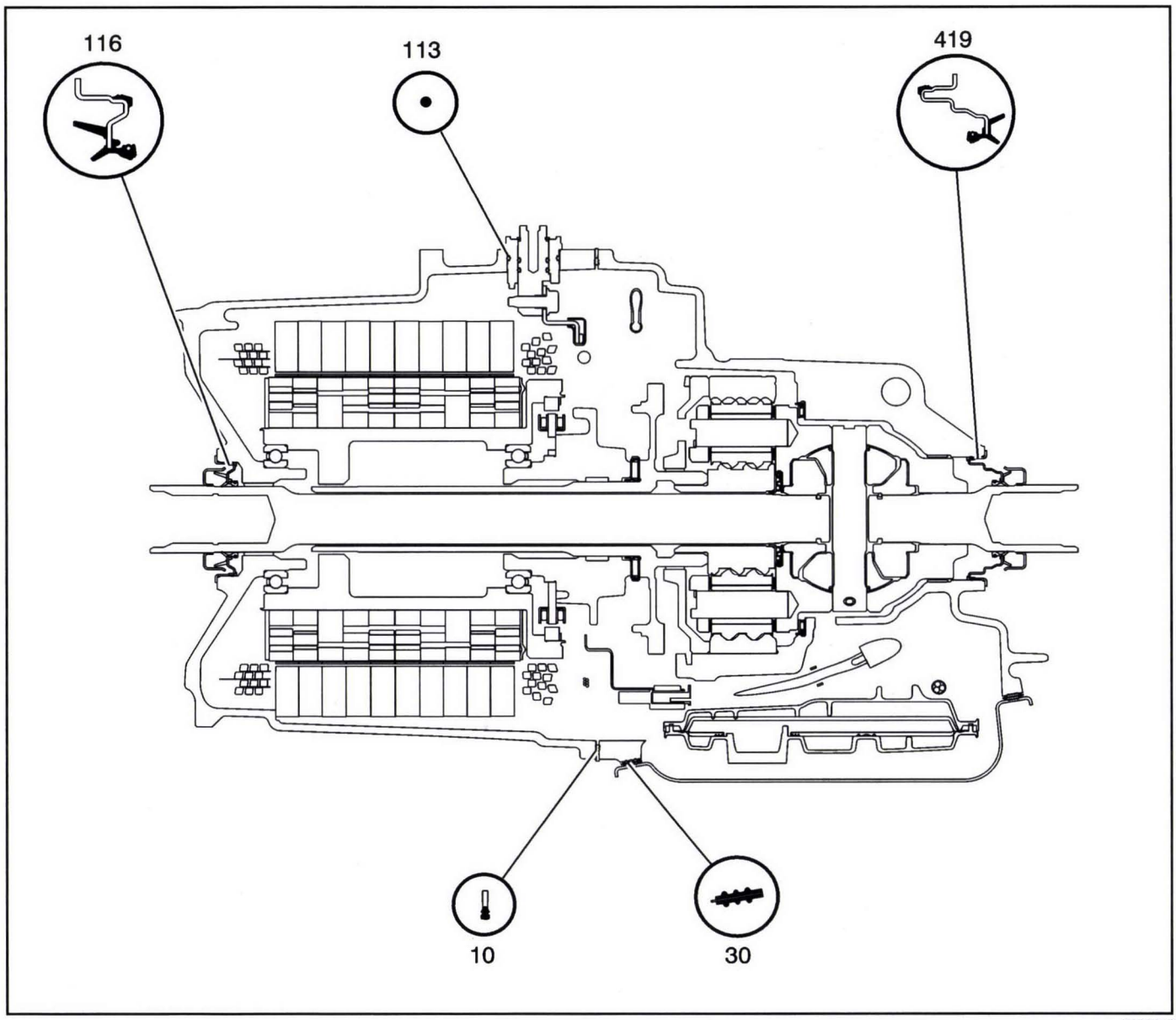
3329221

Legend

- (9) Front Differential Carrier Bearing (LHS)
- (115) Front Differential Carrier Bushing
- (117) Drive Motor Rotor Bearing Assembly
- (154) Front Differential Carrier Bearing (RHS)
- (156) Front Differential Carrier Sun Gear Thrust Bearing
- (207) A/Trans Fluid Pump Motor Rotor Bearing Washer
- (211) A/Trans Fluid Pump Motor Cable Seal Washer
- (213) A/Trans Fluid Pump Motor Cable Seal Washer
- (301) Front Differential Side Gear Thrust Washer (Selectable)
- (303) Front Differential Pinion Gear Thrust Washer
- (308) Front Differential Bearing Race
- (310) Front Differential Drive Pinion Gear Thrust Washer
- (311) Front Differential Carrier Planetary Pinion Gear Roller Bearing
- (418) Front Differential Carrier Bushing

Seal Locations

Seal Locations (1 of 2)

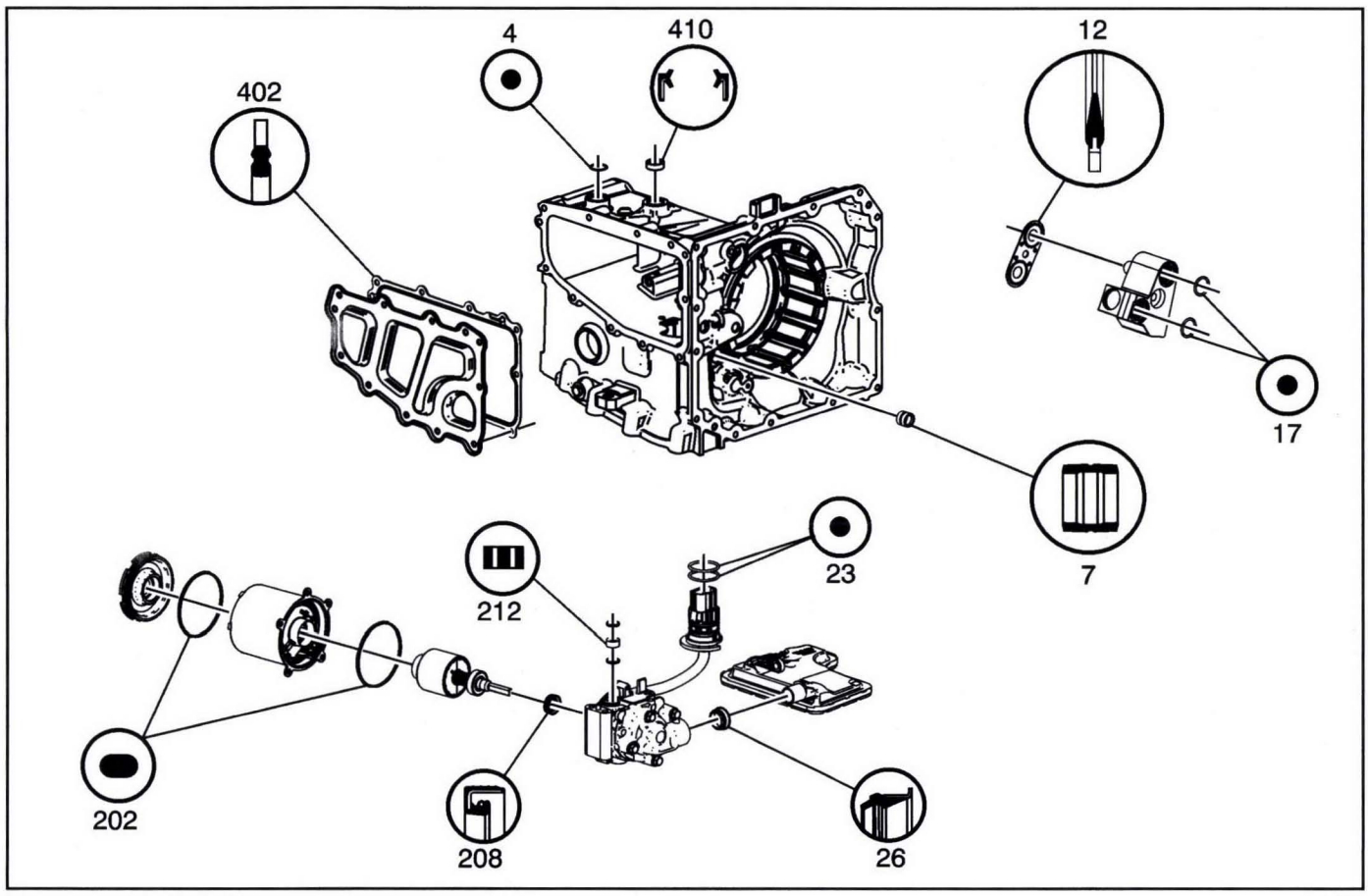


3329219

Legend

(10)	A/Trans Case Gasket	(116)	Front Wheel Drive Shaft Oil Seal Assembly (LHS)
(30)	A/Trans Fluid Pan Gasket	(419)	Front Wheel Drive Shaft Oil Seal Assembly (RHS)
(113)	Drive Motor Power Inverter Module Connector Seal		

Seal Locations (2 of 2)



3329220

Legend

(4)	Transmission Fluid Fill Cap O-ring Seal	(26)	A/Trans Fluid Filter Seal
(7)	A/Trans Case Fluid Passage Seal	(202)	A/Trans Fluid Pump Motor Cover Seal
(12)	Transmission Fluid Cooler Thermal Bypass Valve Gasket	(208)	A/Trans Fluid Pump Motor Rotor Seal
(17)	Transmission Fluid Cooler Connector Seal	(212)	A/Trans Fluid Pump Motor Cable Seal
(23)	A/Trans Fluid Pump Motor Cable Seal Washer	(402)	Shift Control Shaft Cover Gasket
		(410)	Manual Shift Shaft Seal

Diagnostic Information and Procedures

DTC P0711-P0713

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P0711: Transmission Fluid Temperature Sensor Performance
DTC P0712: Transmission Fluid Temperature Sensor Circuit Low Voltage
DTC P0713: Transmission Fluid Temperature Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Transmission Fluid Temperature Sensor Signal	P0712	P0713	P0713	P0711
Low Reference	—	P0713	—	P0711

Typical Scan Tool Data

Transmission Fluid Temperature

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running in Park, normal operating temperature **Parameter Normal Range:** −39 to +160°C (−38 to +320°F)			
Transmission Fluid Temperature Sensor Signal	Greater than 160°C (320°F)	Less than −39°C (−38°F)	Less than −39°C (−38°F)*
Low Reference	—	Less than −39°C (−38°F)	Less than −39°C (−38°F)*
* Internal Transmission Fluid Temperature Sensor damage may result if shorted to B+			

Circuit/System Description

The primary source of heat in the transmission is the drive motor generator. The drive motor generator is cooled by the transmission fluid. Hot fluid exits the drive motor generator and flows to the transmission cooler supply line. The supply line connects to the transmission cooler, which is internal to the radiator. The transmission fluid cooler pipe assembly is equipped with an internal thermostat that opens at 80°C (176°F) for optimum transmission operation and efficiency. The transmission cooler pipe thermostat is part of the transmission fluid cooler pipe assembly, located near the transmission and is not serviced separately. From the cooler, the fluid returns through the transmission fluid cooler pipe assembly and enters the lubrication circuits. After lubricating the internal components, the fluid returns to the oil pan. The transmission fluid temperature sensor is part of the transmission control wire harness and is not serviced separately.

Conditions for Running the DTC

The system voltage is 11–18 V.

P0711

- DTC P0712, P0713, P262B, U0293, or U179A is not set.
- ECM is active for greater than 2 s.
- Vehicle Off time is greater than 21,600 s.
- HV battery charging off time is greater than 7,200 s.
- HV battery thermal conditioning off time is greater than 7,200 s.
- Transmission Fluid Temperature is −40 to +160°C (−40 to +320°F).
- 12V battery voltage is greater than 11V.

P0712 and P0713

12V battery voltage is greater than 11V.

Conditions for Setting the DTC

P0711

The difference between the Transmission Fluid Temperature and the average of the following temperatures is greater than 20°C (68°F) for 0.1 s:

- Drive Motor Inverter Temperature
- Auxiliary Transmission Fluid Pump Inverter Temperature
- Hybrid/EV electronics coolant temperature

P0712

The Transmission Fluid Temperature parameter is greater than 160°C (320°F) for greater than 2 s.

P0713

The Transmission Fluid Temperature parameter is less than or equal to −40°C (−40°F) for greater than 2 s.

Action Taken When the DTC Sets

DTCs P0711, P0712 and P0713 are Type B DTCs.

Conditions for Clearing the DTC

DTCs P0711, P0712 and P0713 are Type B DTCs.

Diagnostic Aids

While driving, the Transmission Fluid Temperature parameter on the scan tool should rise steadily to a normal operating temperature, and then stabilize. Ask about the customer's driving habits, overloading, etc. Ensure the transmission cooling system is functioning normally.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 16-7

Connector End View Reference

Component Connector End Views on page 11-455

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-92

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-44152 Jumper Harness

For equivalent regional tools, refer to *Special Tools on page 16-96*.

Circuit/System Verification

1. Vehicle ON.
2. Verify the scan tool Transmission Fluid Temperature Sensor parameter is between −39 to +120°C (−38 to +248°F) and changes with vehicle drive time.

⇒ **If not between −39 to +120°C (−38 to +248°F) or does not change**

Refer to Circuit/System Testing.

⇓ **If between −39 to +120°C (−38 to +248°F) and changes**

3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

5. All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 minutes for all vehicle systems to power down.
2. Connect *DT-44152* jumper harness to the vehicle harness.
3. Test for less than 5 Ω between the Transmission Fluid Temperature Sensor low reference circuit terminal N and ground.

⇒ **If 5 Ω or greater**

3.1. Vehicle OFF, disconnect the harness connector at the K20 ECM.

3.2. Test for less than 2 Ω in the Transmission Fluid Temperature Sensor low reference circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K20 ECM.

⇓ **If less than 5 Ω**

4. Vehicle ON.
5. Verify the scan tool Transmission Fluid Temperature Sensor parameter is colder than −39°C (−38°F).

⇒ **If warmer than −39°C (−38°F)**

5.1. Vehicle OFF, disconnect the harness connector at the K20 ECM.

5.2. Test for infinite resistance between the Transmission Fluid Temperature Sensor signal circuit terminal M and ground.

⇒ If less than infinite resistance, repair the short to ground on the Transmission Fluid Temperature Sensor signal circuit.

⇒ If infinite resistance, replace the K20 ECM.

⇓ **If colder than −39°C (−38°F)**

6. Install a 3 A fused jumper wire between the Transmission Fluid Temperature Sensor signal circuit terminal M and the Transmission Fluid Temperature Sensor low reference circuit terminal N.
7. Verify the scan tool Transmission Fluid Temperature sensor parameter is warmer than 149°C (300°F).

⇒ **If colder than the 160°C (320°F)**

7.1. Vehicle OFF, disconnect the harness connector at the K20 ECM, vehicle ON.

7.2. Test for less than 1 V between the Transmission Fluid Temperature Sensor signal circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇓ If less than 1 V

7.3. Vehicle OFF.

7.4. Test for less than 2 Ω in the Transmission Fluid Temperature Sensor signal circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the K20 ECM.

⇓ **If warmer than 160°C (320°F)**

8. Test the Transmission Control Wiring Harness circuits 2761 and 2032 for a short to voltage, short to ground, an open/high resistance, or short together.

⇒ If not OK, replace the Transmission Control Wiring Harness.

⇒ If OK, test or replace the B13 Transmission Fluid Temperature Sensor.

Component Testing

Static Test

1. Vehicle OFF, disconnect the X175 transmission 20-way connector.

   Note: A thermometer can be used to test the sensor off vehicle.

2. Test the B13 Transmission Fluid Temperature Sensor by comparing the sensor temperature to a known temperature while monitoring the sensor resistance. Compare the readings with the *Temperature Versus Resistance (Transmission Fluid Temperature Sensor) on page 16-3* table and verify that the resistance is within the specification.

⇒ **If the transmission fluid temperature resistance does not match the specified value**

2.1. Test the Transmission Control Wiring Harness circuits 2761 and 2032 for a short to voltage, short to ground, an open/high resistance, or short together.

⇒ If not OK, replace the Transmission Control Wiring Harness.

⇒ If OK, test or replace the B13 Transmission Fluid Temperature Sensor.

⇓ **If transmission fluid temperature resistance tests OK**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Transmission Control Wiring Harness Removal on page 16-70* for transmission control wiring harness or transmission fluid temperature sensor replacement.
- *Control Module References on page 6-3* for ECM replacement, programming, and setup.

DTC P1824, P182A-P182F, P1838, or P1839

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC P1824: Internal Mode Switch P Circuit High Voltage
DTC P182A: Internal Mode Switch A Circuit Low Voltage
DTC P182B: Internal Mode Switch B Circuit Low Voltage
DTC P182C: Internal Mode Switch B Circuit High Voltage
DTC P182D: Internal Mode Switch P Circuit Low Voltage
DTC P182E: Internal Mode Switch Indicates Invalid Range
DTC P182F: Internal Mode Switch C Circuit High Voltage
DTC P1838: Internal Mode Switch A Circuit High Voltage
DTC P1839: Internal Mode Switch C Circuit Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Transmission Range Signal A	P182A	P1838	P1838	P182E
Transmission Range Signal B	P182B	P182C	P182C	P182E
Transmission Range Signal C	P1839	P182F	P182F	P182E
Transmission Range Signal P	P182D	P1824	P1824	P182E
Ground	—	P1824, P182C, P182E, P182F, P1838	—	P182E

Typical Scan Tool Data

Internal Mode Switch A/B/C/P

Circuit	Normal Range	Short to Ground	Open	Short to Voltage
Operating Conditions: Vehicle ON, range selector in Park				
Transmission Range Signal A	LOW	LOW	High	High
Transmission Range Signal B	High	LOW	High	High
Transmission Range Signal C	High	LOW	High	High
Transmission Range Signal P	LOW	LOW	High	High
HI = 12 volts LOW = 0 volts				

Transmission Internal Mode Switch Logic

Gear Selector Position	Signal A	Signal B	Signal C	Signal P
Park (P)	LOW	High	High	LOW
Reverse (R)	LOW	LOW	High	High
Neutral (N)	High	LOW	High	LOW

Gear Selector Position	Signal A	Signal B	Signal C	Signal P
Drive (D)	High	LOW	LOW	High
Low (L)	High	High	LOW	LOW

Circuit/System Description

The transmission internal mode switch, often referred to as the automatic transmission manual shift shaft position switch, is a dual sliding hall-effect switch attached to the control valve body within the transmission. The 9 outputs from the switch indicate which position is selected by the transmission manual shaft. Four outputs (A, B, C, P) are range selection inputs to the ECM. Five outputs (R1, R2, D1, D2, S) are direction selection inputs to the hybrid/EV powertrain control module 1. The input voltage at the modules is high when the switch is open and low when the switch is closed to ground. The state of each input is displayed on the scan tool as Internal Mode Switch A/B/C/P and Internal Mode Switch Status D1/D2/R1/R2/S. The Internal Mode Switch Range input parameters represented are transmission range signal A, signal B, signal C, and signal P. The Internal Mode Switch Direction input parameters represented as Internal Mode Switch Status signal R1, signal R2, signal D1, signal D2, and signal Start.

Conditions for Running the DTC

- No internal mode switch DTCs P181C, P181D, P181E, P181F, P183A, P183B, P183C, P183D, P183E, P183F, P184A, or P184B are set
- The Run/Crank is active and the system voltage is 9–32 V.

P182A, P182C, and P182D

Transmission direction state is Park.

P182E

Vehicle speed is less than 512 km/h (318 mph) for 5 s.

Conditions for Setting the DTC

P1824

Internal Mode Switch signal circuit P is Low in Park for 2 s.

P182A

Internal Mode Switch signal circuit A is High in Drive for 2 s.

P182B

Internal Mode Switch signal circuit B is High in Park for 2 s.

P182C

Internal Mode Switch signal circuit B is Low in Drive for 2 s.

P182D

Internal Mode Switch signal circuit P is High in Drive for 2 s.

P182E

ECM detects an invalid Internal Mode Switch range state for 5 s.

P182F

Internal Mode Switch signal circuit C is Low in Drive for 5 s.

P1838

Internal Mode Switch signal circuit A is Low in Park for 2 s.

P1839

Internal Mode Switch signal circuit C is High in Park for 8 s.

Action Taken When the DTC Sets

- The PRNDL position indicator on the instrument cluster will be blank.
- Vehicle creep torque and hill hold are disabled.

Conditions for Clearing the DTC

DTCs P1824, P182A-P182F, P1838, and P1839 are Type B DTCs.

Diagnostic Aids

The transmission internal mode switch connects electrically to the control solenoid valve assembly. Inspect the transmission internal mode switch, harness, connector, and control solenoid assembly pins for metallic debris. Use a terminal test kit for any test that requires probing the control solenoid assembly harness connector or a component harness connector. The transmission internal mode switch can be damaged by currents exceeding 2 mA. Test the transmission internal mode switch for an open condition whenever a short to voltage condition is observed.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 16-7

Connector End View Reference

Component Connector End Views on page 11-455

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-92

Scan Tool Reference

Control Module References on page 6-3 for scan tool information.

Special Tools

DT 44152 Jumper Harness

For equivalent regional tools, refer to *Special Tools on page 16-96*.

Circuit/System Verification

1. Vehicle ON, verify the scan tool Internal Mode Switch A/B/C/P parameter for each transmission range state. Refer to Transmission Internal Mode Switch Logic.
2. Perform the *Range Selector Lever Cable Adjustment on page 16-37* procedure to verify proper adjustment.
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
4. Verify DTC P1824, P182A-P182F, P1838, or P1839 is not set.

⇒ **If any of the DTCs are set**

Refer to Circuit/System Testing.

⇓ **If none of the DTCs are set**

5. All OK

Circuit/System Testing

Note: You must perform the Circuit/System Verification before proceeding with Circuit/System Testing.

1. Vehicle OFF, disconnect the X175 transmission harness connector.
2. Connect the *DT 44152* Jumper Harness to the X175 transmission harness connector.
3. Test for less than 10 Ω between the ground circuit terminal E and ground.

⇒ **If 10 Ω or greater**

3.1. Disconnect the X3 harness connector from the K20 ECM.

3.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, replace the Harness Assembly.

⇒ If the circuit tests normal, replace the K20 ECM.

⇓ **If less than 10 Ω**

4. Vehicle in Service Mode.
5. Verify the scan tool Internal Mode Switch A/B/C/P parameter displays High for all four signal circuits.

⇒ **If any parameter displays LOW**

5.1. Vehicle OFF. Disconnect the K20 ECM.

5.2. Test the signal circuits for a short to ground or short together.

⇒ If any of the circuits are shorted to ground or together, replace the Harness Assembly.

⇒ If the circuits are not shorted to ground or together, replace the K20 ECM.

⇓ **If all parameters display HIGH**

6. Vehicle in Service Mode.
7. Install a 3 A fused jumper wire between each signal circuit listed below and the ground circuit terminal E:
   - Switch Signal A: terminal A
   - Switch Signal B: terminal B
   - Switch Signal C: terminal C
   - Switch Signal P: terminal D
8. Verify each scan tool Internal Mode Switch A/B/C/P parameter displays LOW when grounded.

⇒ **If any parameter displays HIGH when grounded**

Test the signal circuit for an open/short to voltage or short together.

⇒ If an open/short to voltage or short together is found, replace the Transmission Control Wiring Harness Assembly.

⇒ If an open/short to voltage or short together is not found, K20 ECM.

⇓ **If each signal circuit parameter displays LOW when grounded**

9. Remove the transmission.
10. Test the Transmission Control Wiring Harness Assembly for an open/short to voltage, short to ground or short together.

⇒ **If an open/short to voltage, short to ground, or short together is found**

Replace the Transmission Control Wiring Harness Assembly.

⇓ **If the circuits test normal**

11. Replace the B15 Transmission Internal Mode Switch.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Transmission Control Wiring Harness Removal on page 16-70*
- *Manual Shift Shaft Position Switch Removal on page 16-68* for B15 Transmission Internal Mode Switch, often referred to as the Automatic Transmission Manual Shift Shaft Position Switch replacement
- *Control Module References on page 6-3* for K20 ECM replacement, programming, and setup

DTC P215B

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptor

DTC P215B: Vehicle Speed – Output Shaft Speed Not Plausible

Circuit/System Description

The ECM determines vehicle speed based on drive motor speed. This signal is interpreted by the hybrid/EV powertrain control module 1, for speed and direction and is transmitted through the serial data circuits to the ECM module. The ECM and hybrid/EV powertrain control module 1 compare the output speed signal with the anti-lock brake system (ABS) wheel speed sensor signal from the electronic brake control module.

Conditions for Running the DTC

- Serial data communication is active for is greater than 1 s.
- The vehicle is not in Park or neutral.

Conditions for Setting the DTC

The ECM OSS signal and the ABS wheel speed sensor signals differ by greater than 20 km/h (12 mph) for 1 s.

Action Taken When the DTC Sets

ECM

- PROPULSION POWER REDUCED message is displayed on the driver information center.
- The hybrid/EV powertrain control module 1 uses the anti-lock brake system (ABS) wheel speed sensor signal from the electronic brake control module to determine vehicle speed.

Hybrid/EV Powertrain Control Module 1

The hybrid/EV powertrain control module 1 requests the hybrid/EV powertrain control module 2 to open the high voltage contactors.

Conditions for Clearing the DTC

P215B is a Type A DTC.

Diagnostic Aids

The propulsion system is very sensitive to the OSS signal for overall operation. The following conditions listed below may cause this DTC to set:

- Transmission mechanical concern such as a broken differential or axle.
- Certain slippery road conditions resulting in erratic wheel spin.
- Certain vehicle spin out or loss of control conditions.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 16-7

Connector End View Reference

Component Connector End Views on page 11-455

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-92

Scan Tool Reference

Control Module References on page 6-3 for scan tool information.

Circuit/System Verification

1. Verify DTC C1207–C1210, C1221–C1228, C1232–C1235, U0073, U0074, or U0129 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-92*.

⇓ **If the DTCs are not set**

2. Verify there are no transmission mechanical concerns such as a broke axle or differential.

⇒ **If a transmission mechanical concern exists**

Refer to *Symptoms - Automatic Transmission on page 16-25*.

⇓ **If no mechanical concerns**

Refer to Circuit/System Testing.

Circuit/System Testing

1. Program the control module which set the DTC with the latest software version and retest for DTCs.

⇒ **If the DTC resets**

Replace the control module which set the DTC.

⇓ **If the DTC does not reset**

2. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Control Module References on page 6-3 for K20 ECM or Drive Motor Generator Power Inverter Module, also called the T6 Power Inverter Module, replacement, programming, and setup.

Symptoms - Automatic Transmission

Note: Use the symptom tables only if the following conditions are met:

- Refer to *Diagnostic Starting Point - Vehicle on page 6-90*.
- There are no DTCs set.
- The control modules can communicate via the serial data link.
- Review the system operation in order to familiarize yourself with the system functions. Refer to *Transmission General Description on page 16-92* and *Transmission Component and System Description on page 16-93*.

Visual/Physical Inspection

Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- Fluid Diagnosis
  - *Transmission Fluid Level and Condition Check on page 16-28*
  - *Fluid Leak Diagnosis on page 16-30*
  - *Automatic Transmission Fluid Leaks on page 16-30*
- Noise and Vibration Diagnosis
  - *Whine/Growl Noise That Changes with Vehicle Speed on page 16-32*
  - *Noise in Drive or Reverse Gear on page 16-32*
  - *Vibration on page 16-32*
  - *Noise and Vibration Analysis on page 16-32*
- Range Performance Diagnosis
  - *No Park or Drive on page 16-32*
  - *No Drive in All Ranges on page 16-33*
  - *No Reverse on page 16-33*
- *No Drive in All Ranges on page 16-33*
- Symptom Not Found or No Symptom Detected
  - *Transmission Fluid Level and Condition Check on page 16-28*
  - *Drive Motor Power Inverter Module 3 Phase Cable Inspection on page 16-25*
  - *Road Test on page 16-29*
  - *Coolant/Water in Transmission on page 16-30*
  - *Case Porosity Repair on page 16-31*
  - *Bushing and Mating Shaft Inspection on page 16-31*

Drive Motor Power Inverter Module 3 Phase Cable Inspection

Danger: Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

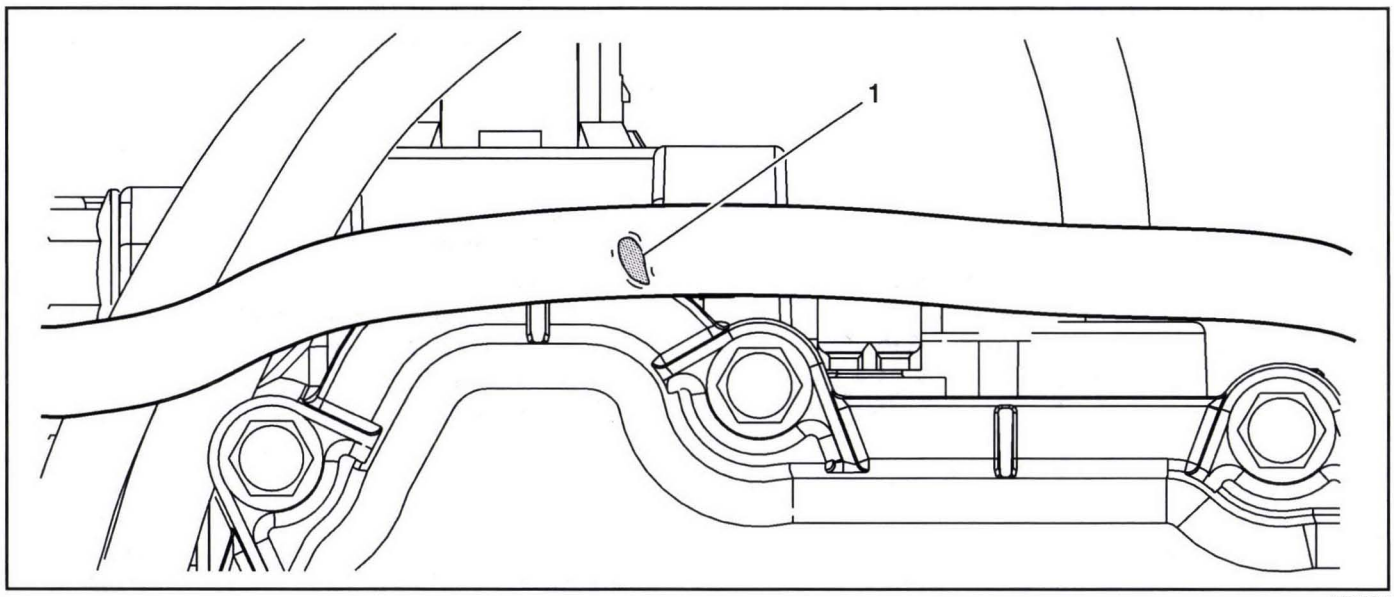
The High Voltage Disabling procedure will perform the following tasks:

- ***Identify how to disable high voltage.***
- ***Identify how to test for the presence of high voltage.***
- ***Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.***

Failure to follow the procedures exactly as written may result in serious injury or death.

Note: This procedure is for inspection and repair of the 3 phase high voltage cable outer sheathing only.

Visual/Physical Inspection



2539280

Cable Construction

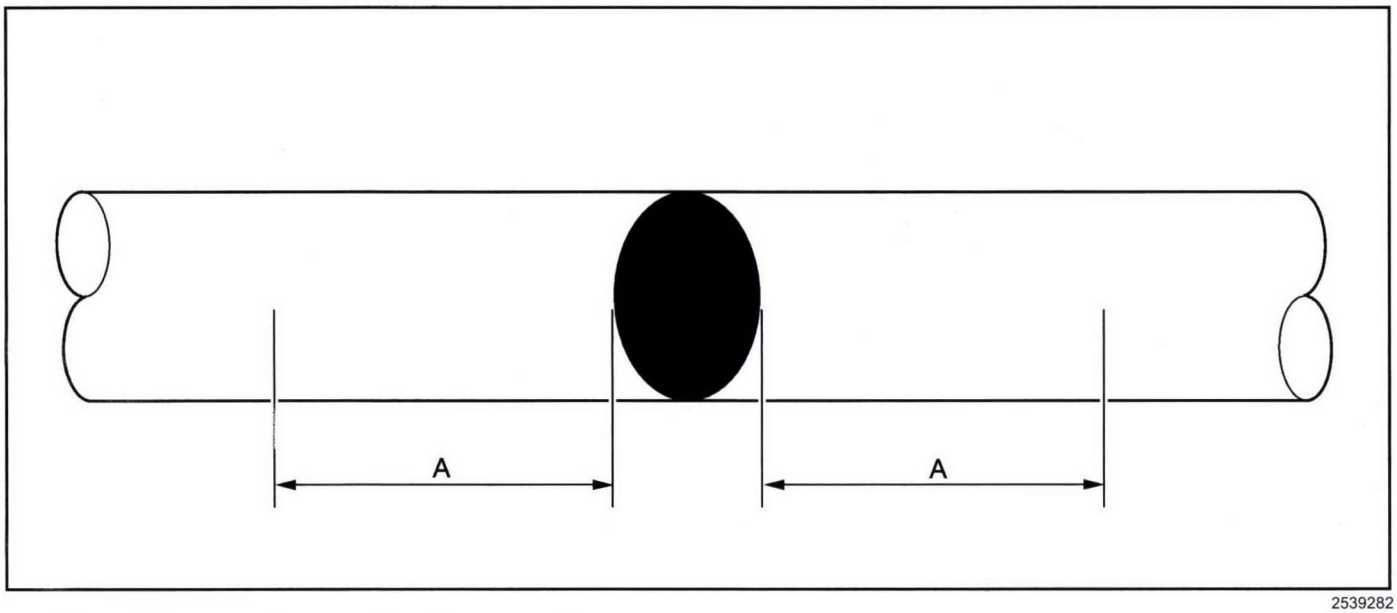
- Outer Jacket or Sheathing
- Braided Shield
- Insulated Conductor
- 3 Individual Cables per Cable Assembly

1. Disconnect or remove the drive motor generator power inverter module cover to gain better visibility of 3 phase cables.
2. Determine if the exposure is limited to the braided shield or has penetrated to the insulated conductor.
3. If the conductor wire is exposed, the cable assembly should be replaced.

   Note: If the 3 phase cable drive motor generator power inverter module connector is removed a new seal must be used.

4. Examine the cables for abrasion or damage. It may be necessary to disconnect the 3 phase cable from the drive motor generator power inverter module (1 bolt per connector) for proper examination.
5. If exposure is limited to the braided shield, the cable can be repaired using the instructions in this procedure.
6. If the damage (1) is within 100 mm of the end gate clamp on the cable then the cable should be replaced.
7. If the damage (1) is more than 25 mm in length then the cable should be replaced.
8. Above you will find an example of a cable that can be repaired.

Cable Repair Process

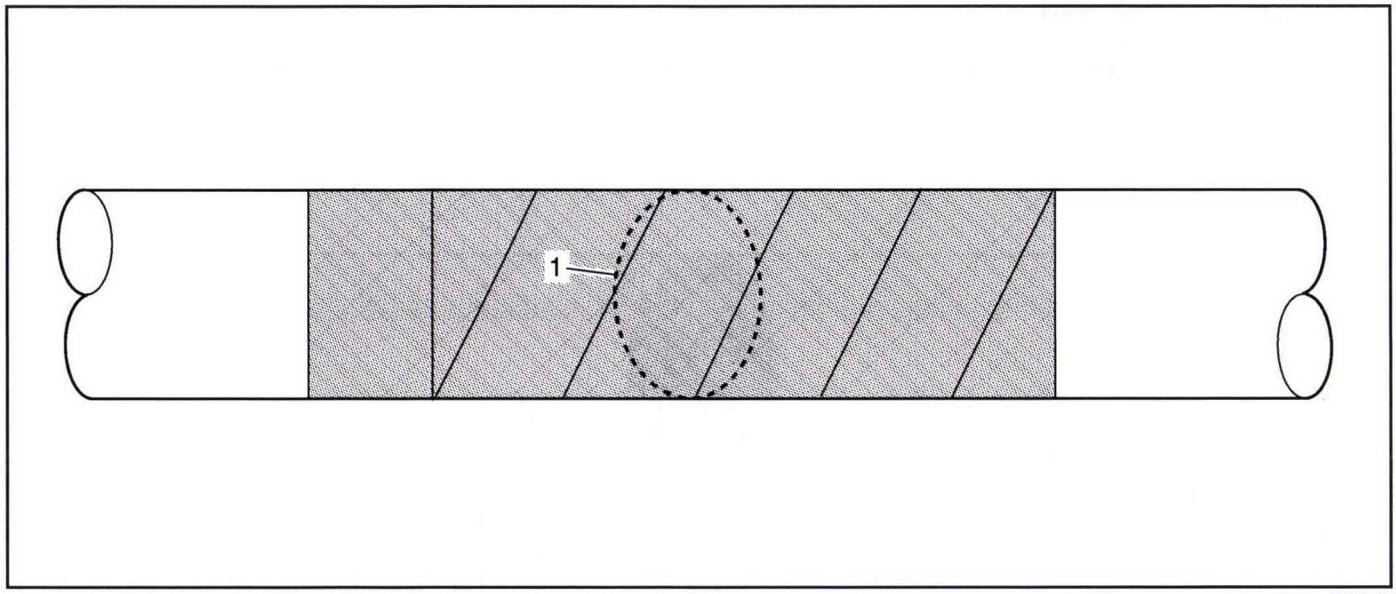


2539282

Note: This procedure requires the use of Orange Silicone Rescue Tape that can be procured locally by Harbor products.

1. If abrasion or damage is evident on the outer sheathing and a repair can be made please follow the procedure below closely.
2. Clean the cable area on either side of the abrasion or damage approximately 6 inches.
3. Before beginning to tape the cable, you must cut the Silicone Rescue Tape to the length you expect to use.
4. You must also remove the Silicone Rescue Tape from the backing material.

   Note: Tape is pulled to half of its original width during entire application (Very Important).
5. Wrap tape around cable twice while stretching tape.
6. Wrap tape along cable.
   - 6.1. Begin spiral of tape along cable – Be sure to stretch tape while spiraling along cable.
   - 6.2. Tape must be overlapped on itself so that there are always 2 tape layers on cable.
7. Finish applying tape by ending spiral and then wrap the tape twice on itself (like step 5) and tear or cut remaining tape and smooth onto itself.
8. The Silicone Rescue Tape must wrap the cable to provide 1.25 in (A) of coverage from edge of damage on each side of the abrasion or damaged area.



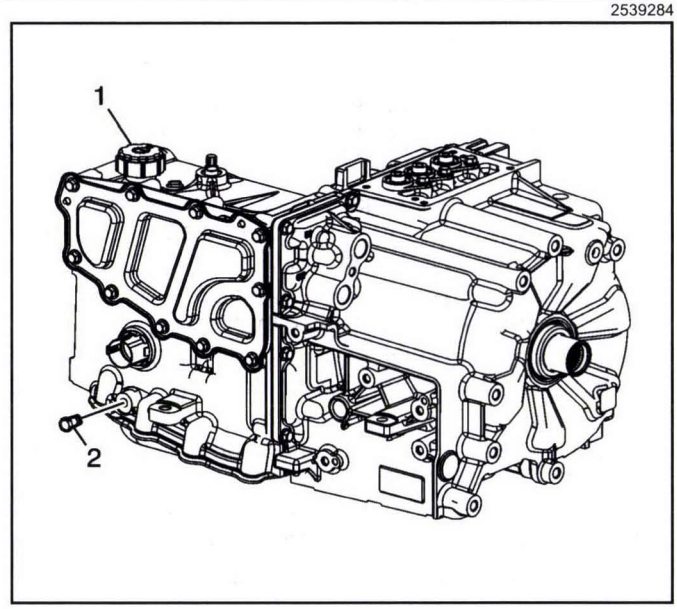
2539284

9. Above you will see the abrasion or damage "spot (1)" covered by Silicone Rescue Tape.
10. If connector/s to TPIM were removed install with new seal and torque to **9.5** N•m **+/— 1.5** N•m **(84 lb in +/— 1 1/2 lb in)**.
11. Install drive motor generator power inverter module cover.

Transmission Fluid Level and Condition Check

This procedure checks both the transmission fluid level, as well as the condition of the fluid itself. Since the transmission on this vehicle is not equipped with a fill tube and dipstick, a fill plug in the top of the transmission and level set plug is used to set the fluid level.

Caution: The transmission fluid level must be checked when the transmission fluid temperature is between 30–50°C (86–122°F). If the transmission fluid temperature is not within this range, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a transmission fluid temperature outside this range will result in either an under or over-filled transmission. Transmission fluid temperature greater than 50°C will result in an under-filled condition, transmission fluid temperature less than 30°C will result in an over-filled condition. An under-filled transmission will cause premature component wear or damage. An over-filled transmission will cause fluid to discharge out the vent tube, fluid foaming, or pump cavitation.



2899111

Caution: The auxiliary transmission fluid pump must be running when the A/Trans case hole plug is removed or excessive fluid loss will occur, resulting in an under-filled condition. An under-filled transmission will cause premature component wear or damage.

Note: Continue to monitor the Transmission Fluid Temperature. If the Transmission Fluid Temperature is not within the specified values, reinstall the trans oil level check plug and repeat the previous steps.

1. Operate vehicle until transmission fluid temperature is 30–50°C (86–122°F).
2. Raise the vehicle.
3. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
4. Vehicle ON with the transmission in Park (P).
5. With the scan tool, command the auxiliary transmission fluid pump speed to ON for 10 minutes and keep it running throughout the process.

6. Remove the A/Trans case hole plug (2).
7. Verify fluid slowly drips from the A/Trans case hole.
   ⇒ If the fluid is flowing as a steady stream, wait until the fluid begins to drip.
   ⇒ If no fluid comes out, add 0.5 L (0.52 qts) of fluid using a commercially available hand pump through the case fill hole (1) until fluid drips out. Refer to *Transmission Fluid Drain and Fill on page 16-42*.

Caution: Refer to *Fastener Caution on page 0-8*.

8. Install A/Trans case hole plug (2) and torque to 12 N•m (106 lb in).
9. Using the scan tool, command the auxiliary transmission fluid pump speed to OFF.
10. Vehicle Off.
11. Install the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.

Fluid Condition Inspection

- Inspect the fluid color. New fluid is red in color. The fluid may also turn dark from normal use.

  Note: Dark fluid color alone does not indicate contamination or overheating.

- If the fluid color is very dark or black and also has a burnt odor, inspect the fluid for excessive metal particles or other debris which may indicate transmission wear or damage. Refer to *Road Test on page 16-29* to verify transmission operation. Change the transmission fluid if a burnt odor is the only condition found.
- Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to *Coolant/Water in Transmission on page 16-30*.

Road Test

Note: The Road Test Procedure should be performed only as part of the Symptom Diagnosis. Refer to *Symptoms - Automatic Transmission on page 16-25*.

The following test provides a method of evaluating the condition of the automatic transmission. The test is structured so that most driving conditions would be achieved. The test is divided into the following parts:

- Electrical Function Check
- Torque Control
- Part Throttle Torque Control
- Coasting

Note: Complete the test in the sequence given. Incomplete testing cannot guarantee an accurate evaluation.

Before the road test, ensure the following:

- Transmission fluid level is correct. Refer to *Transmission Fluid Level and Condition Check on page 16-28*.
- Tire pressure is correct.

During the road test:

- Perform the test only when traffic conditions permit.
- Operate the vehicle in a controlled, safe manner.
- Observe all traffic regulations.
- View the scan tool data while conducting this test.

  Take along qualified help in order to operate the vehicle safely.
- Observe any unusual sounds or smells.

After the road test, check the following:

- Inspect for proper transmission fluid level. Refer to *Transmission Fluid Level and Condition Check on page 16-28*.
- Inspect for any diagnostic trouble codes (DTCs) that may have set during the testing. Refer to the applicable DTC.
- Monitor the scan tool data for any abnormal readings or data.
- Inspect for fluid leaks. Refer to *Fluid Leak Diagnosis on page 16-30*.

Electrical Function Check

Perform this procedure first in order to ensure the electronic transmission components are functioning properly. If these components are not checked, a simple electrical condition could be misdiagnosed.

1. Connect the scan tool.
2. Ensure the gear selector is in PARK and set the parking brake.
3. Verify that the following scan tool data can be obtained and is functioning properly.

   Refer to *K20 Engine Control Module: Scan Tool Information on page 6-40* for typical data values. Data that is questionable may indicate a concern.
   - Driver Requested Axle Torque
   - Vehicle Speed
   - Output Shaft Direction
   - Brake Switch
   - IMS A/B/C/P
   - IMS
   - Trans. Fluid Temp.
4. Check the garage shifts.
   4.1. Apply the brake pedal and ensure the parking brake is set.
   4.2. Move the gear selector through the following ranges:
      4.2.1. PARK to REVERSE
      4.2.2. REVERSE to NEUTRAL
      4.2.3. NEUTRAL to DRIVE
   4.3. Pause 2 to 3 seconds in each gear position.

      Note: These shifts can-not be felt when trans is functioning properly.

   4.4. Verify the gear engagements are immediate and not harsh.

5. Monitor transmission range on the scan tool, trans data list.
   5.1. Apply the brake pedal and ensure the parking brake is set.
   5.2. Move the gear selector through all ranges.
   5.3. Pause 2 to 3 seconds in each range.
   5.4. Return gear selector to PARK.
   5.5. Verify that all selector positions match the scan tool display.
6. Check throttle position input.
   6.1. Apply the brake pedal and ensure the parking brake is set.
   6.2. Ensure the gear selector is in PARK.

If any of the above checks do not perform properly, record the result for reference after completion of the road test.

Manual Gear Range Selection

This range is used to slow the vehicle more when the driver's foot is lifted from the throttle.

Reverse

Perform the following test using a 10–15 percent throttle position.

1. With the vehicle stopped, move the gear selector to REVERSE.
2. Slowly accelerate the vehicle.
3. Verify that there is no noticeable slip, noise or vibration.

Automatic Transmission Fluid Leaks

Checks	Causes
Case Assembly	• Inspect for porosity or damage on the sealing surfaces • Inspect for loose oil cooler line bolts or damaged oil cooler line seals • Inspect for damaged manual shift shaft seal • Inspect for damaged or worn axle seal or axle seal Slinger on the axle shafts • Inspect for loose fluid level plug
Case Cover assembly	• Inspect for porosity or damage on the sealing surface • Inspect for damaged case cover gasket • Inspect for loose case cover assembly bolts • Inspect for loose, damaged or leaking case cover assembly bore plugs

Coolant/Water in Transmission

Caution: Antifreeze or water will deteriorate the seals and gaskets. Both conditions may cause damage to the transmission.

If antifreeze or water has entered the transmission, perform the following:

1. Disassemble the transmission.
2. Replace all of the rubber type seals. The coolant will attack the seal material which will cause leakage.
3. Replace all of the nylon parts – washers.
4. Thoroughly clean and rebuild the transmission, using new gaskets and oil filter.
5. Flush the cooler lines after the transmission cooler has been properly repaired or replaced.

Fluid Leak Diagnosis

General Method

1. Verify that the leak is transmission fluid.

Caution: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.

2. Thoroughly clean the suspected leak area using a rag.
3. Operate the vehicle for 24 km (15 mi) or until normal operating temperatures are reached.
4. Park the vehicle over clean paper or cardboard.
5. Shut OFF the vehicle.
6. Look for fluid spots on the paper.
7. Make the necessary repairs.

Powder Method

Caution: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.

1. Thoroughly clean the suspected leak area using a rag.
2. Apply an aerosol type leak tracing powder to the suspected leak area.
3. Operate the vehicle for 24 km (15 mi) or until normal operating temperatures are reached.
4. Shut OFF the vehicle.
5. Inspect the suspected leak area.
6. Trace the leak path through the powder in order to find the source of the leak.
7. Make the necessary repairs.

Dye and Black Light Method

A fluid dye and black light kit is available from various tool manufacturers.

1. Follow the manufacturer's instructions in order to determine the amount of dye to use.
2. Operate the vehicle for 24 km (15 mi) or until normal operating temperatures are reached.
3. Detect the leak with the black light.
4. Make the necessary repairs.

Find the Cause of the Leak

Pinpoint the leak and trace the leak back to the source. You must determine the cause of the leak in order to repair the leak properly. For example, if you replace a gasket, but the sealing flange is bent, the new gasket will not repair the leak. You must also repair the bent flange. Before you attempt to repair a leak, check for the following conditions, and make repairs as necessary:

Gaskets

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Improperly tightened fasteners
- Dirty or damaged threads
- Warped flanges or sealing surface
- Scratches, burrs, or other damage to the sealing surface
- Damaged or worn gasket
- Cracking or porosity of the component
- Improper sealant used, where applicable
- Incorrect gasket

Seals

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Damaged seal bore
- Damaged or worn seal
- Improper installation
- Cracks in component
- Manual shaft or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

Possible Points of Fluid Leaks

Transmission Case Side Cover

- Incorrectly tightened bolts
- Improperly installed or damaged gasket/seal
- Damaged mounting face
- Incorrect gasket seal

Case Leak

- Damaged manual shaft seal
- Loose or damaged oil cooler lines/seals
- Worn or damaged axle shaft oil seal
- Loose line pressure pipe plug or fluid level pipe plug
- Porous casting

Leak at the Vent

- Overfilled system
- Water or coolant in the fluid; The fluid will appear milky
- Transmission case porous
- Plugged vent

Case Porosity Repair

Some external leaks are caused by case porosity in non-pressurized areas. You can usually repair these leaks with the transmission in the vehicle.

1. Thoroughly clean the area to be repaired with a cleaning solvent. Air dry the area.

Warning: Epoxy adhesive may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.

2. Using instructions from the manufacturer, mix a sufficient amount of an epoxy to make the repair.
3. While the transmission case is still hot, apply the epoxy. You can use a clean, dry soldering acid brush to clean the area and also to apply the epoxy cement. Make certain that the area to be repaired is fully covered.
4. Allow the epoxy cement to cure for three hours before operating the vehicle.
5. Repeat the fluid leak diagnosis procedures.

Bushing and Mating Shaft Inspection

Note: Proper bushing and corresponding mating shaft inspection should be performed before replacing the bushing, shaft, and in some cases, the component which houses the bushing. Thoroughly clean and dry the bushing and shaft surfaces before inspecting for damage.

Any of the following bushing conditions require replacement of the bushing and/or housing:

- Discoloration due to heat distress
- Misalignment or displacement of bushing as a result of spinning in housing
- Medium to heavy scoring that can be easily detected with fingernail. Light scoring is a normal condition.
- Debris embedded into the bushing lining material
- Obvious damage, including excessive and uneven wear
- Excessive polishing. Minor polishing of the bushing is an indication of normal wear and does not require replacement.

Any of the following conditions require replacement of the bushing's mating shaft:

- Discoloration due to heat distress
- Rough surface finish that can be easily detected with finger
- Obvious shaft abnormalities, including warping or uneven surfaces
- Obvious damage or cracking

Vibration

Checks	Causes
Sun Gear Thrust Washer	Inspect for wear or damage.
Sun Gear Carrier Assembly	• Inspect the carrier assembly for damaged pinion gears, thrush washers, pins, and rollers. • Inspect for a worn or damaged center support roller bearing assembly. • Inspect for damaged thrust bearings. • Inspect the carrier assembly for damaged output carrier rear sun gear thrust bearing (captured).
Front Differential Carrier Assembly	Inspect for damaged gears and bearings.

Noise and Vibration Analysis

A noise or vibration that is noticeable when the vehicle is in motion MAY NOT be the result of the transmission.

- Inspect the tires for the following conditions:
  - – Uneven wear
  - – Imbalance
  - – Mixed sizes
  - – Mixed radial and bias ply
- Inspect the suspension components for the following conditions:
  - – Alignment wear or damage
  - – Loose fasteners
  - – Driveline damage or wear
- Inspect the transmission mounts for damage and loose bolts.
- Inspect the transmission case mounting holes for the following conditions:
  - – Missing bolts, nuts, and studs
  - – Stripped threads
  - – Cracks

Whine/Growl Noise That Changes with Vehicle Speed

Checks	Causes
Sun Gear Carrier Thrust Bearing Assembly	• Inspect the carrier assembly for damaged pinion gears, thrust washers, pins, and rollers. • Inspect for a damaged center support roller bearing assembly. • Inspect for damaged thrust bearings. • Inspect for damaged sun gears. • Inspect the carrier assembly for damaged output carrier rear sun gear thrust bearing (captured). • Inspect for damaged or stripped splines on the output carrier assembly.
Internal Gear Thrust Bearing Assembly	Inspect the bearing for wear or damage.
Front Differential Carrier Assembly	Inspect for damaged gears and bearings.
Internal Gear Thrust Washer	Inspect the carrier assembly for damaged pinion gears, thrust washers, pins, and rollers.
Internal Gear Thrust Bearing Assembly	Inspect the bearing for wear or damage.
Internal Gear Thrust Washer	Inspect the washer for wear or damage.

Noise in Drive or Reverse Gear

Checks	Causes
Front Differential Carrier Assembly	Inspect for damaged gears and bearings.
Drive Motor Assembly	Inspect for damaged bearings.

No Park or Drive

Checks	Causes
Front Differential Carrier Assembly	Inspect for damaged gears and bearings.

No Drive in All Ranges

Checks	Causes
Carrier Assembly	• Inspect the carrier assembly for damaged pinion gears, thrust washers, pins, and rollers. • Inspect for damaged thrust bearings. • Inspect for damaged sun gears. • Inspect the carrier assembly for damaged output carrier rear sun gear thrust bearing (captured).
Drive Motor with Generator	**Motor Failure** • Inspect 3 phase cables • Inspect connections at motor • Inspect motor end bearings
Thrust Bearing	Inspect the bearing for wear or damage.
Output Shaft Assembly	Inspect for damaged internal gears.
Front Differential Carrier Assembly	Inspect for damaged gears and bearings.
Sun Gear	Inspect for spline wear or damage.
Fluid Filter Assembly	• Inspect for damaged or restricted fluid filter assembly. • Inspect for damaged fluid filter seal assembly or improper sealing interface, leaks, and fluid aeration.
Auxiliary Fluid Pump Seal	Inspect for worn or damaged seal.

No Reverse

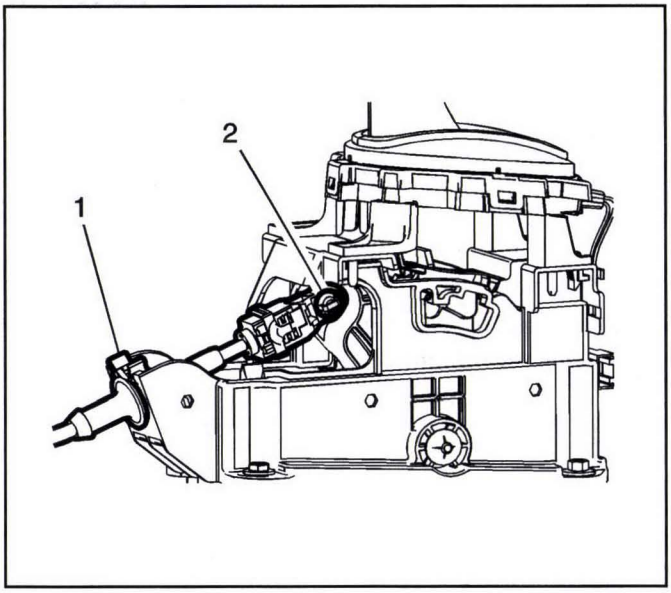
Checks	Causes
Carrier Assembly	• Inspect the carrier assembly for damaged pinion gears, thrust washers, pins, and rollers. • Inspect for damaged thrust bearings. • Inspect for damaged sun gears. • Inspect the carrier assembly for damaged output carrier rear sun gear thrust bearing (captured).
Drive Motor with Generator	**Motor Failure** • Inspect 3 phase cables. • Inspect connections at motor. • Inspect motor end bearings.
Thrust Bearing	Inspect the bearing for wear or damage.
Output Shaft Assembly	Inspect for damaged internal gears.
Front Differential Carrier Assembly	Inspect for damaged gears and bearings.
Sun Gear	Inspect for spline wear or damage.
Fluid Filter Assembly	• Inspect for damaged or restricted fluid filter assembly. • Inspect for damaged fluid filter seal assembly or improper sealing interface, leaks, and fluid aeration.
Auxiliary Fluid Pump Seal	Inspect for worn or damaged seal.

Repair Instructions - On Vehicle

Transmission Control Replacement

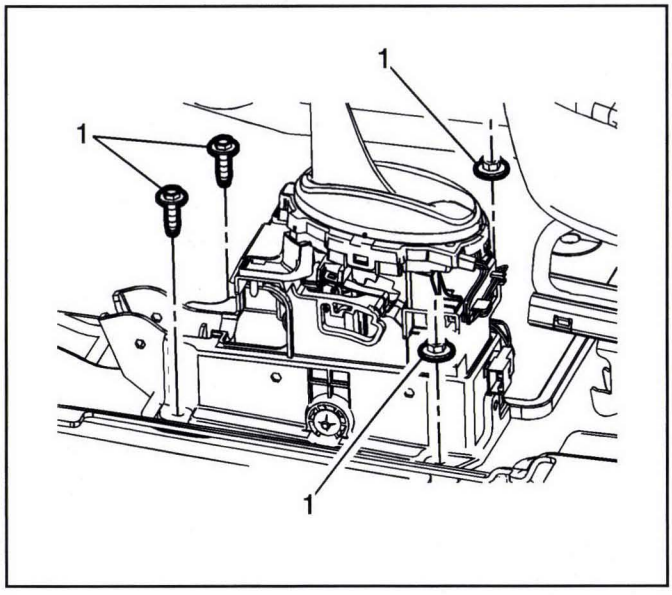
Removal Procedure

1. Set the park brake.
2. Remove the console. Refer to *Front Floor Console Replacement on page 2-48*.



3040211

3. Remove the shift cable (1) from the control assembly.
4. Disconnect the cable (2) from the transmission control assembly pin.
5. Unclip the wiring harness and disconnect the control assembly electrical connector.

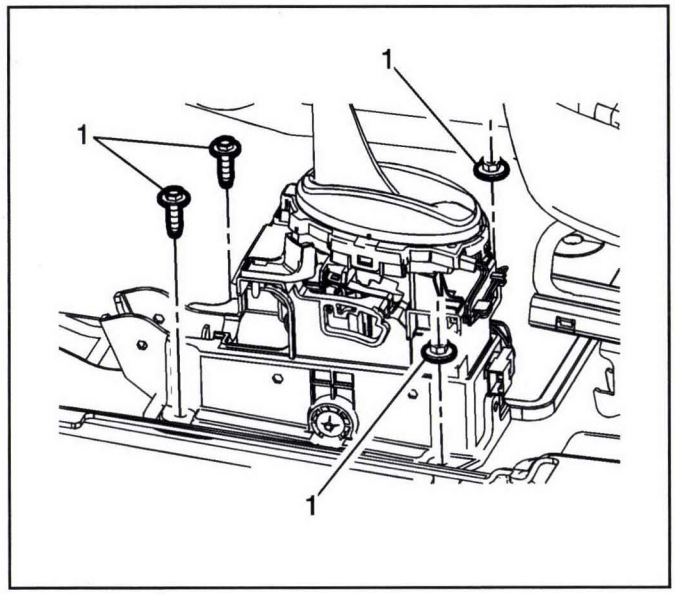


3042457

6. Remove the fasteners (1) from the control assembly.
7. Remove the transmission control assembly.

Installation Procedure

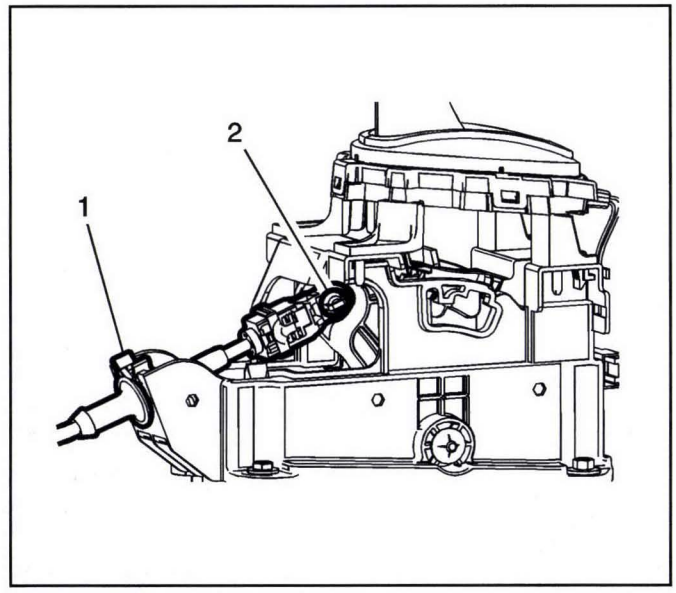
1. Install the control assembly.



3042457

Caution: Refer to *Fastener Caution on page 0-8*.

2. Tighten the transmission control fasteners (1) to **9** N•m **(80 lb in)**.
3. Clip the wiring harness and connect the control assembly electrical connector.



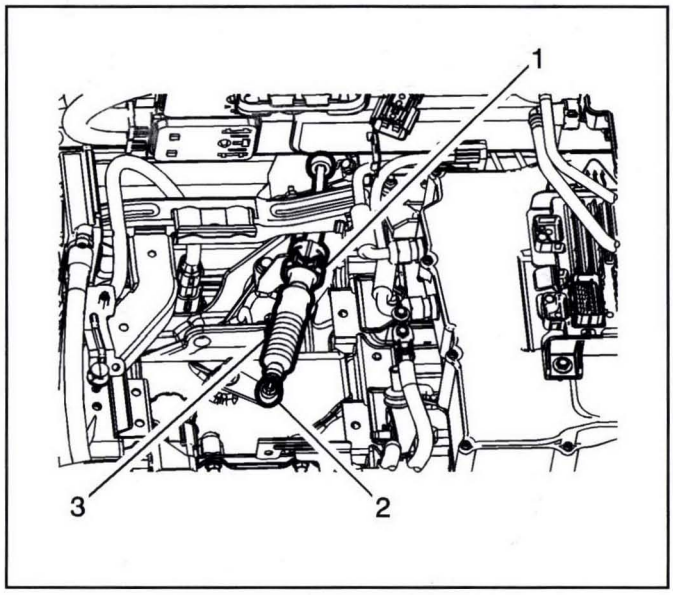
3040211

4. Connect the shift cable (2) onto the control assembly pin.
5. Install the cable (1) onto the control assembly.
6. Adjust the range selector lever cable. Refer to *Range Selector Lever Cable Adjustment on page 16-37*.
7. Install the console. Refer to *Front Floor Console Replacement on page 2-48*.
8. Release the park brake.

Automatic Transmission Range Selector Lever Replacement

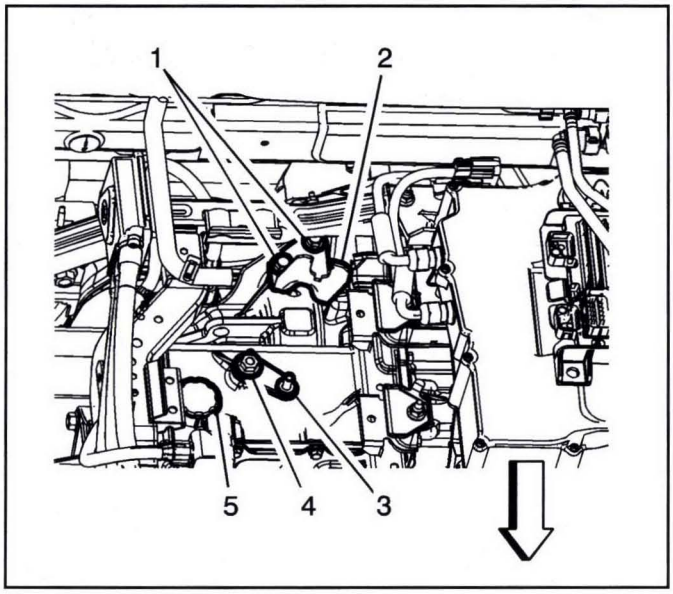
Removal Procedure

1. Set the park brake and chock the wheels.
2. Remove the transmission rear mount bracket. Refer to *Transmission Rear Mount Bracket Replacement on page 16-50*.
3. Remove the range selector lever cable bracket. Refer to *Range Selector Lever Cable Bracket Replacement on page 16-38*.



3032963

4. Disconnect the range selector cable end (2) from the range selector lever.

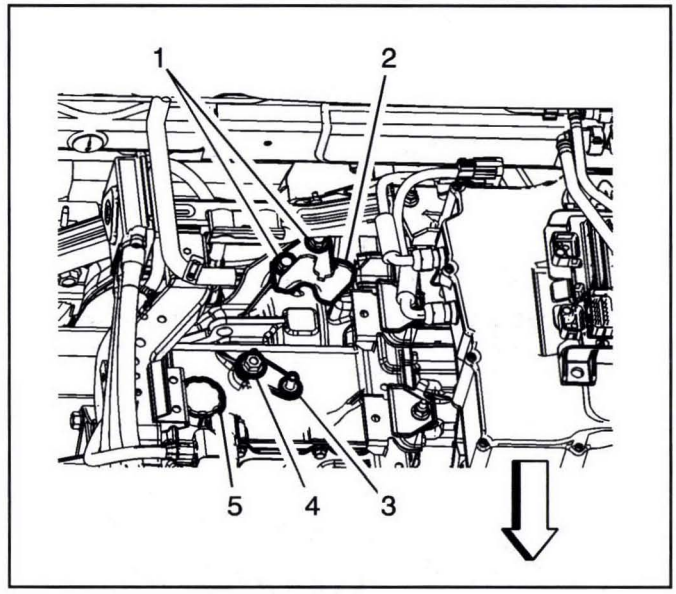


3102950

Warning: Hold the transmission range selector lever while removing or installing the lever retaining nut. Failure to hold the lever can cause damage to the transmission internal park system components which could allow the vehicle to roll when placed in the park position.

5. Remove the range selector lever retaining nut (4).
6. Remove the range selector lever (3).

Installation Procedure



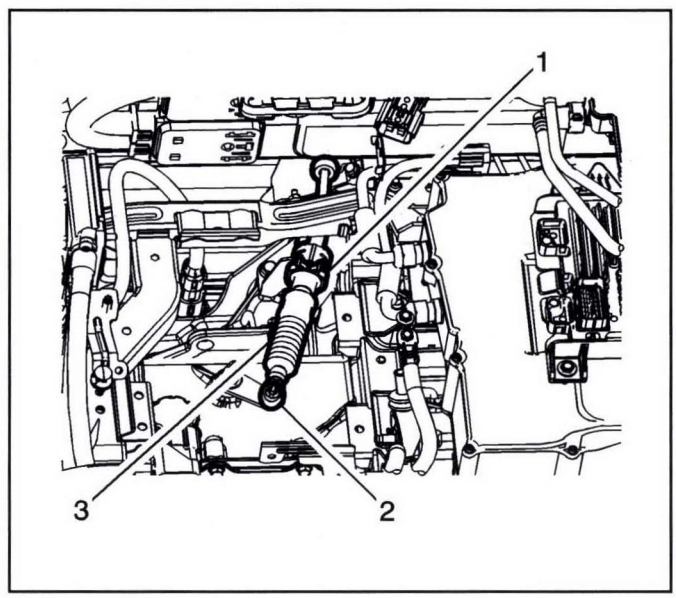
3102950

1. Install the range selector lever (3).

Warning: Hold the transmission range selector lever while removing or installing the lever retaining nut. Failure to hold the lever can cause damage to the transmission internal park system components which could allow the vehicle to roll when placed in the park position.

Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the range selector lever retaining nut (4) then tighten to **30** N•m **(22 lb ft)**.



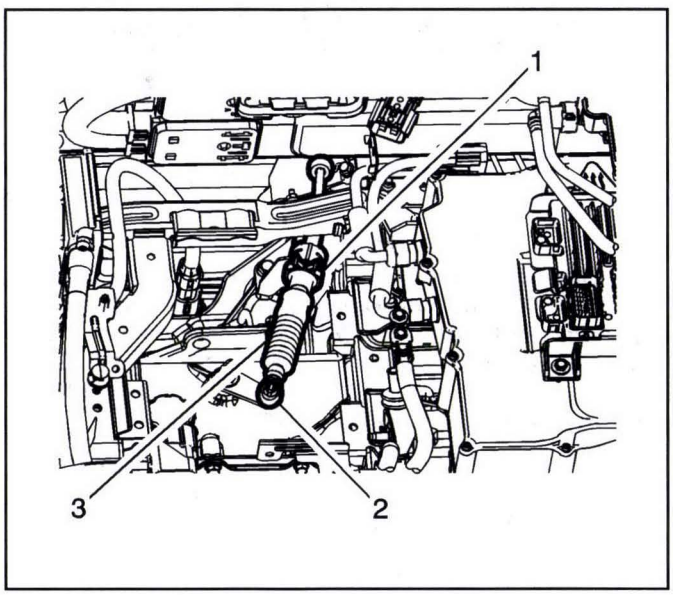
3032963

3. Connect the range selector cable end (2) to the range selector lever.
4. Install the range selector lever cable bracket. Refer to *Range Selector Lever Cable Bracket Replacement on page 16-38*.
5. Install the transmission rear mount bracket. Refer to *Transmission Rear Mount Bracket Replacement on page 16-50*.
6. Adjust the shift cable. Refer to *Range Selector Lever Cable Adjustment on page 16-37*.
7. Verify proper operation of the transmission.

Range Selector Lever Cable Replacement

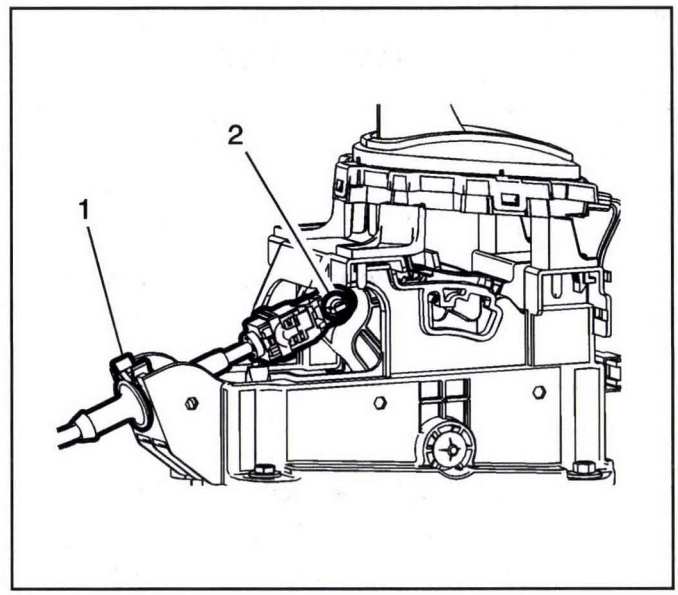
Removal Procedure

1. Set the park brake and chock the wheels.
2. Remove the transmission rear mount bracket. Refer to *Transmission Rear Mount Bracket Replacement on page 16-50*.



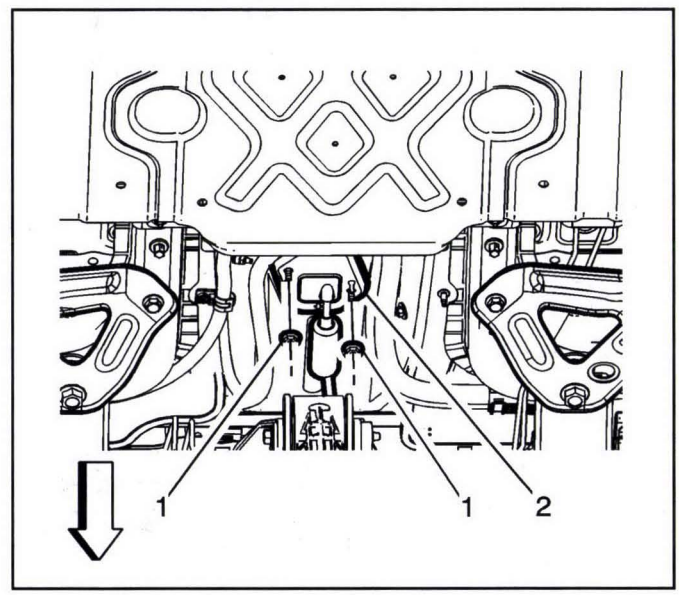
3032963

3. Disconnect the range selector cable end (2) from the range selector lever.
4. Disconnect the shift cable retainer (1) from the shift cable bracket.
5. Remove the console. Refer to *Front Floor Console Replacement on page 2-48*.



3040211

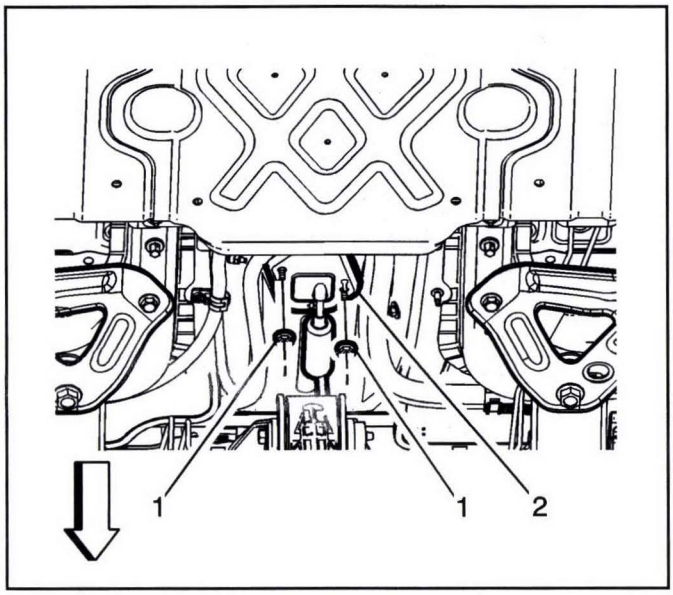
6. Remove the cable (1) from the control assembly.
7. Disconnect the shift cable (2) from the transmission control assembly pin.



3032975

8. Remove the cable closeout panel nuts (1).
9. Remove the shift cable (2) from the vehicle.

Installation Procedure

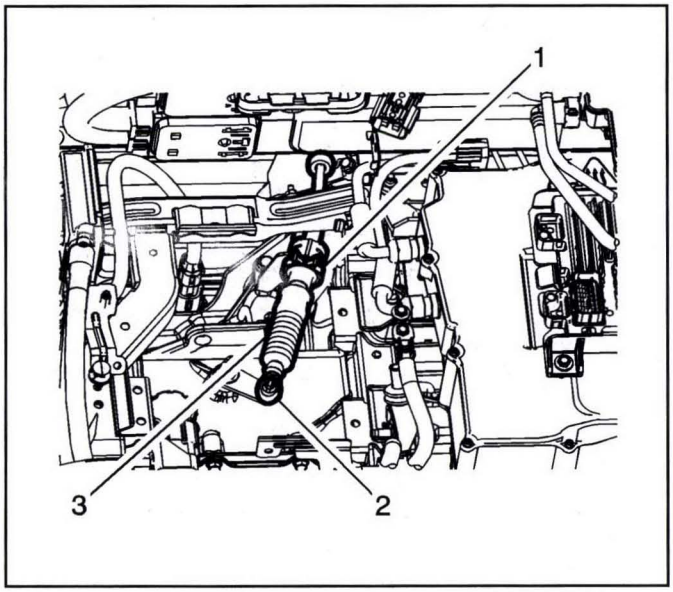


3032975

1. Install the shift cable (2) in the vehicle.

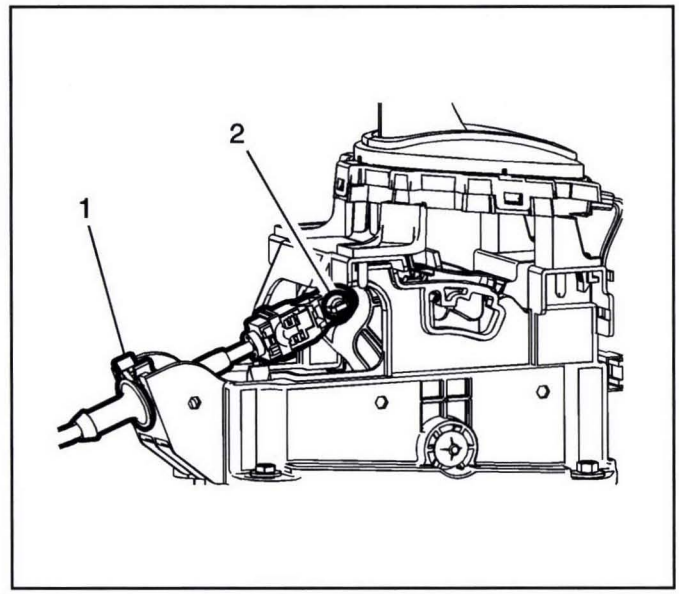
Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the closeout panel nuts (1) and tighten to **6** N•m **(53 lb in)**.



3032963

3. Connect the shift cable retainer (1) to the shift cable bracket.
4. Connect the range selector cable end (2) to the range selector lever.
5. Install the transmission rear mount bracket. Refer to *Transmission Rear Mount Bracket Replacement on page 16-50*.

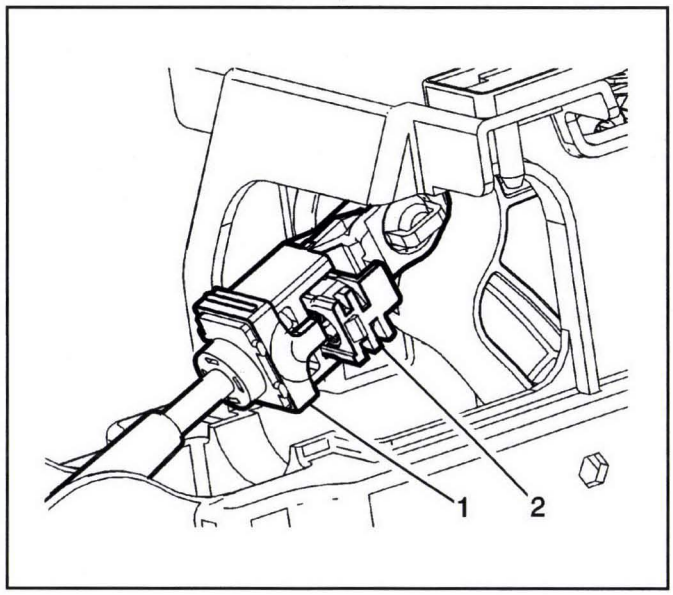


3040211

6. Install the shift cable (1) onto the transmission control assembly.
7. Connect the shift cable (2) onto the control assembly pin.
8. Adjust the shift cable. Refer to *Range Selector Lever Cable Adjustment on page 16-37*.
9. Install the console. Refer to *Front Floor Console Replacement on page 2-48*.
10. Release the park brake.
11. Verify proper operation of the transmission.

Range Selector Lever Cable Adjustment

1. Set the park brake and chock the wheels.
2. Remove the console. Refer to *Front Floor Console Replacement on page 2-48*.
3. Ensure the transmission lever is in the Park position.
4. Ensure the transmission control is in the Park position.



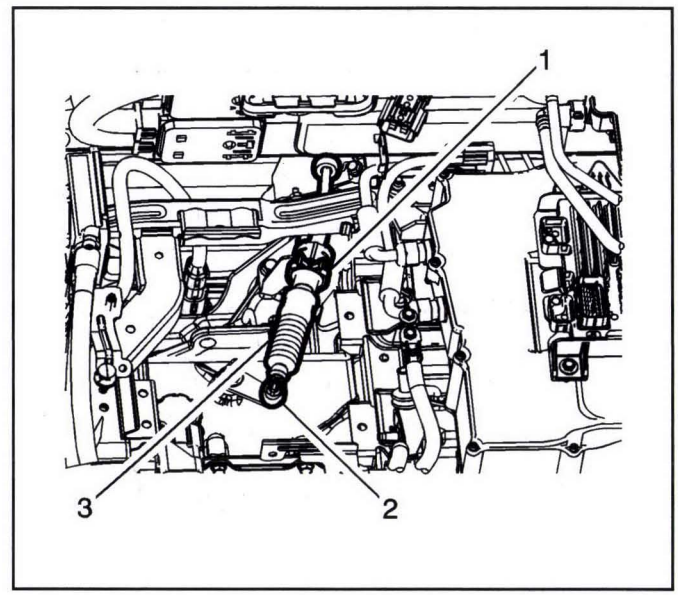
3329457

5. Slide the adjusting retainer (1) downward.
6. Using a suitable trim tool, pull the adjusting tab (2).
7. Depress the adjusting tab (2), until it is completely seated.
8. Slide the adjusting retainer (1) upward until it is fully seated.
9. Release the park brake.
10. Verify proper operation of the transmission.
11. Install the console. Refer to *Front Floor Console Replacement on page 2-48*.

Range Selector Lever Cable Bracket Replacement

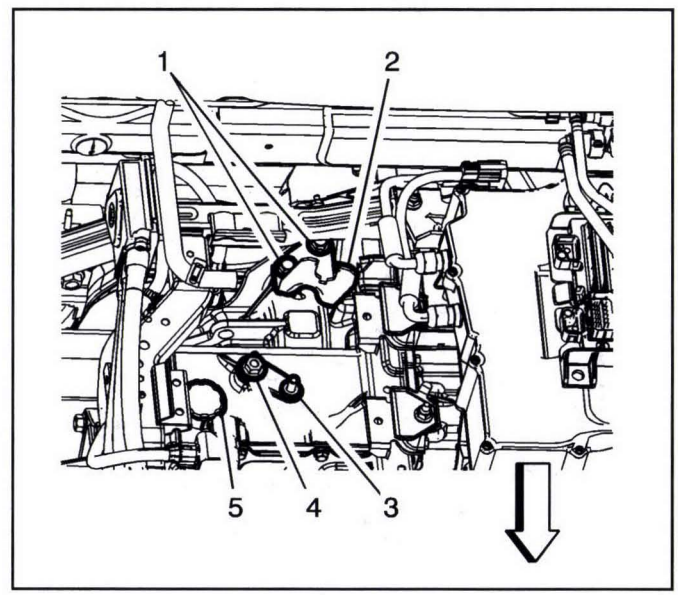
Removal Procedure

1. Set the park brake and chock the wheels.
2. Remove the transmission rear mount bracket. Refer to *Transmission Rear Mount Bracket Replacement on page 16-50*.



3032963

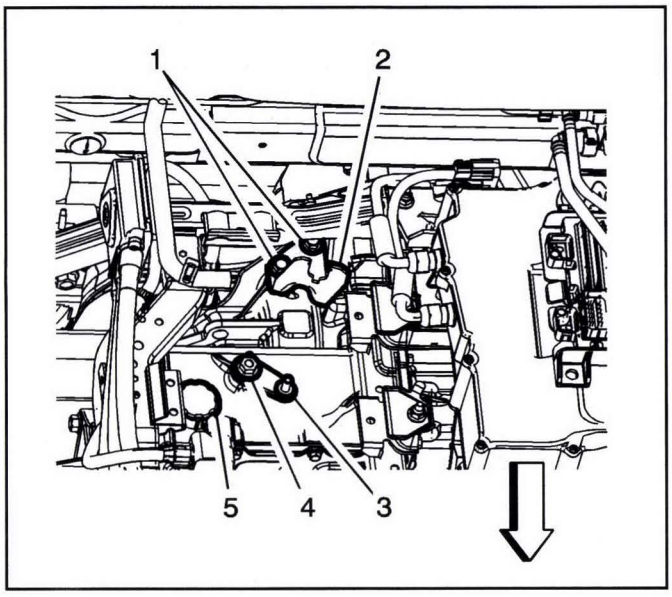
3. Disconnect the range selector cable end (2) from the range selector lever.
4. Disconnect the shift cable retainer (1) from the shift cable bracket.



3102950

5. Remove the range selector cable bracket bolts (1).
6. Remove the range selector cable bracket (2).

Installation Procedure

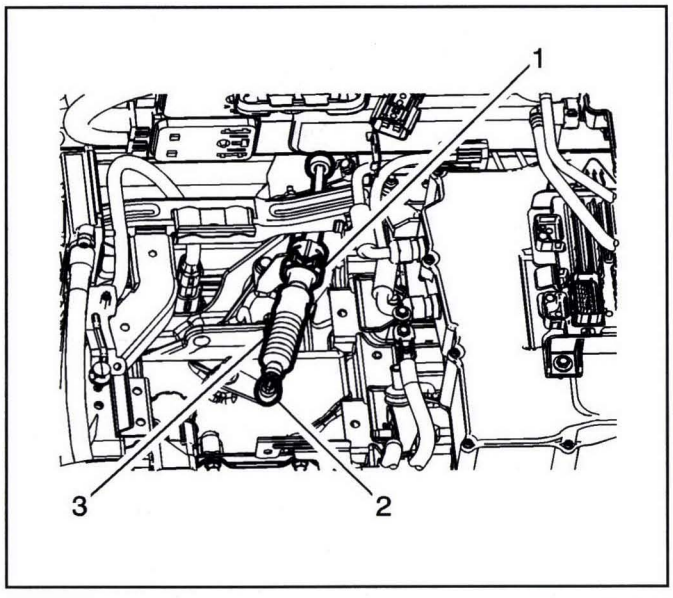


3102950

1. Install the range selector cable bracket (2).

Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the range selector lever cable bracket bolts (1) then tighten to **22** N•m **(16 lb ft)**.



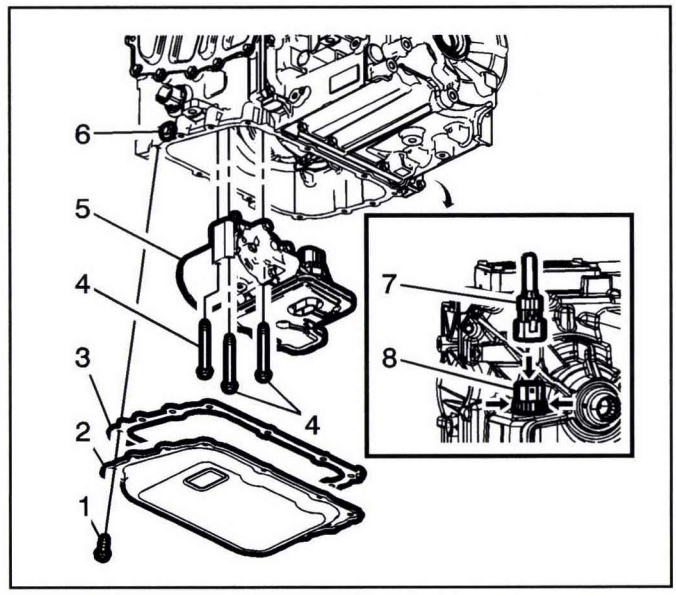
3032963

3. Connect the shift cable retainer (1) to the shift cable bracket.
4. Connect the range selector cable end (2) to the range selector lever.
5. Install the transmission rear mount bracket. Refer to *Transmission Rear Mount Bracket Replacement on page 16-50*.
6. Adjust the shift cable. Refer to *Range Selector Lever Cable Adjustment on page 16-37*.
7. Verify proper operation of the transmission.

Transmission Fluid Pump Replacement

Removal Procedure

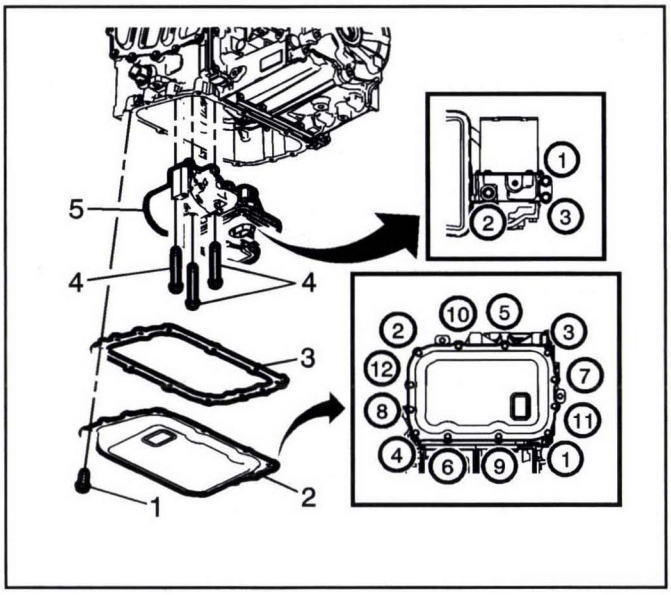
1. Before performing this procedure, review the high voltage safety information. Refer to *High Voltage Safety on page 9-362*.
2. Disable the high voltage systems. Refer to *High Voltage Disabling on page 9-363*.
3. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
4. Place a suitable drain pan under the vehicle.



3350389

5. Drain the transmission fluid from the transmission. Refer to *Transmission Fluid Drain and Fill on page 16-42*.
6. Remove the 12 transmission fluid pan bolts (1).
7. Remove the transmission fluid pan (2) and gasket (3).
8. Disconnect the fluid pump motor cable connector (7).
9. Press the locking tabs inward in order to remove the fluid pump motor connector (8) and push down the upper side of connector.
10. Remove the 3 fluid pump bolts (4).
11. Remove the fluid pump (5) from the transmission, then disconnect the electrical connector.

Installation Procedure



3144112

1. Install the fluid pump (5) to the transmission, then connect the electrical connector.

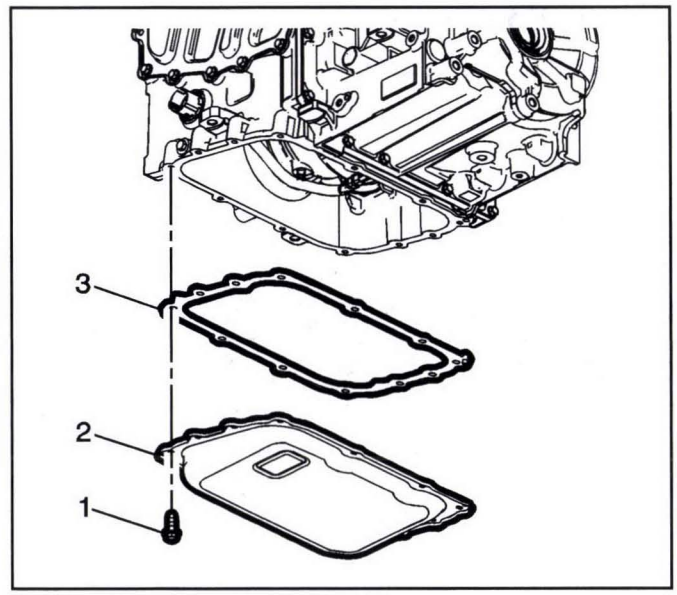
Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the 3 fluid pump bolts (4) bolts, then tighten in the sequence shown to **9** N•m **(80 lb in)**.
3. Install the motor connector into the transmission case and connect the fluid pump motor cable connector.
4. Install the transmission fluid pan gasket (3) to the fluid pan (2),
5. Position the transmission fluid pan (2) and fluid pan gasket (3) to the transmission.
6. Install the 12 transmission fluid pan bolts (1), then tighten in the sequence shown to **9** N•m **(80 lb in)**.
7. Remove the drain pan from under the vehicle.
8. Enable the high voltage systems. Refer to *High Voltage Enabling on page 9-367*.
9. Fill the transmission with fluid. Refer to *Transmission Fluid Drain and Fill on page 16-42*.
10. Install the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
11. Lower the vehicle.
12. Verify proper operation of the transmission.

Transmission Fluid Pan Replacement

Removal Procedure

1. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
2. Place a suitable drain pan under the vehicle.

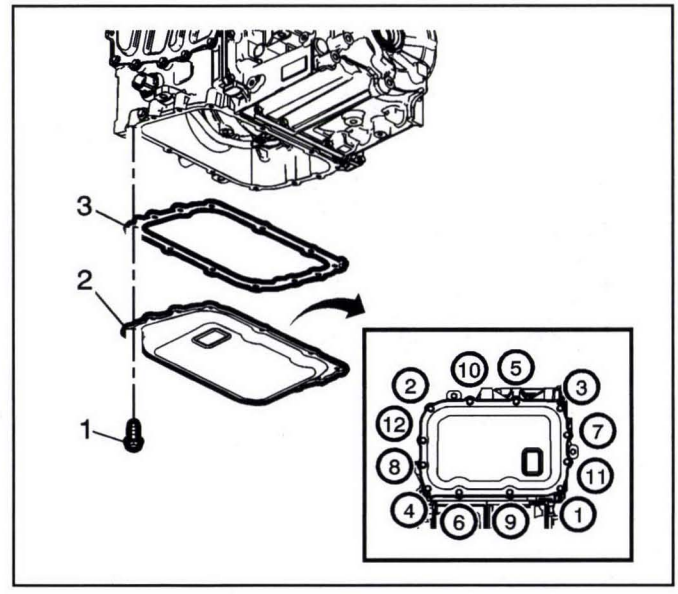


3331406

Note: If the fluid pan is removed, the transmission fluid is discharged.

3. Remove the 12 transmission fluid pan bolts (1).
4. Remove the transmission fluid pan gasket (3) with the fluid pan (2).

Installation Procedure



3331408

Note: Replace the fluid pan with a NEW gasket every time the transmission pan is removed.

1. Install the transmission fluid pan gasket (3) to the fluid pan (2),

Caution: Refer to *Fastener Caution on page 0-8*.

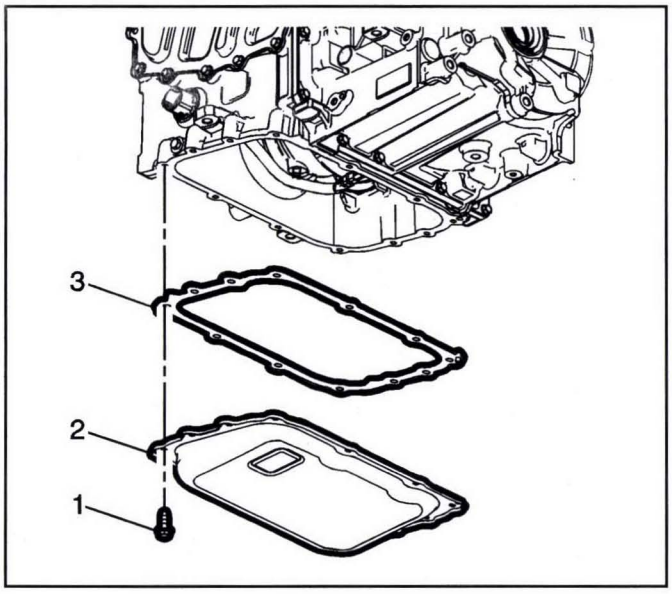
2. Install the 12 transmission fluid pan bolts (1), then tighten in the sequence shown to **9** N•m **(80 lb in)**.
3. Remove the drain pan from under the vehicle.
4. Lower the vehicle.

5. Fill the transmission with fluid. Refer to *Adhesives, Fluids, Lubricants, and Sealers on page 16-5* and *Approximate Fluid Capacities on page 16-5*.
6. Check the transmission fluid level. Refer to *Transmission Fluid Level and Condition Check on page 16-28*.
7. Install the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
8. Verify proper operation of the transmission.

Fluid Temperature Sensor Replacement

Removal Procedure

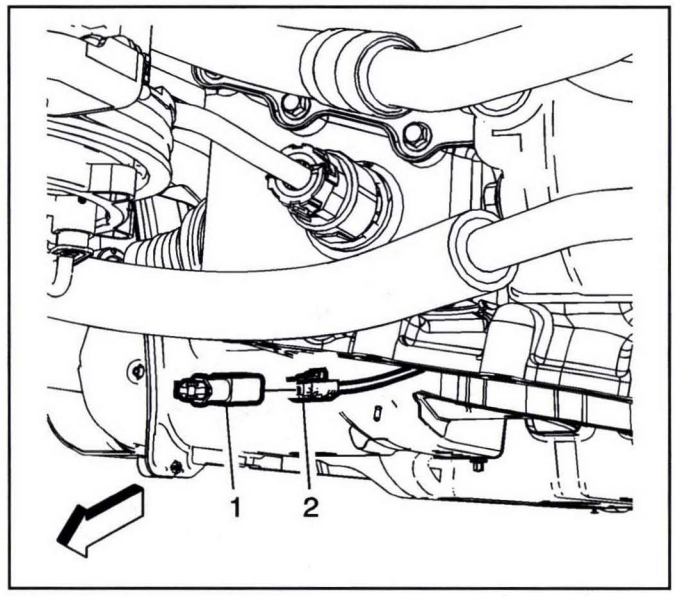
1. Before performing this procedure, review the high voltage safety information. Refer to *High Voltage Safety on page 9-362*.
2. Disable the high voltage systems. Refer to *High Voltage Disabling on page 9-363*.
3. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
4. Place a suitable drain pan under the vehicle.



3331406

Note: If the fluid pan is removed, the transmission fluid is discharged.

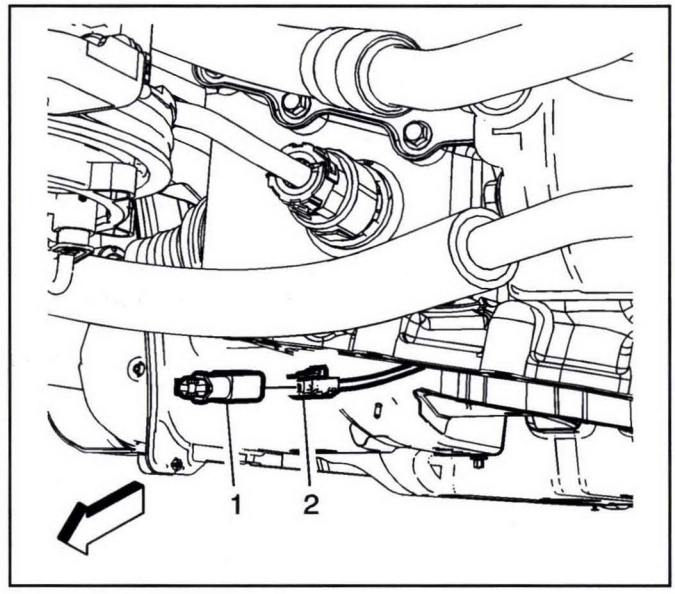
5. Remove the 12 transmission fluid pan bolts (1).
6. Remove the transmission fluid pan gasket (3) with the fluid pan (2).
7. Disconnect the fluid temperature sensor wiring harness from the wiring harness retainer inside the transmission.



3331766

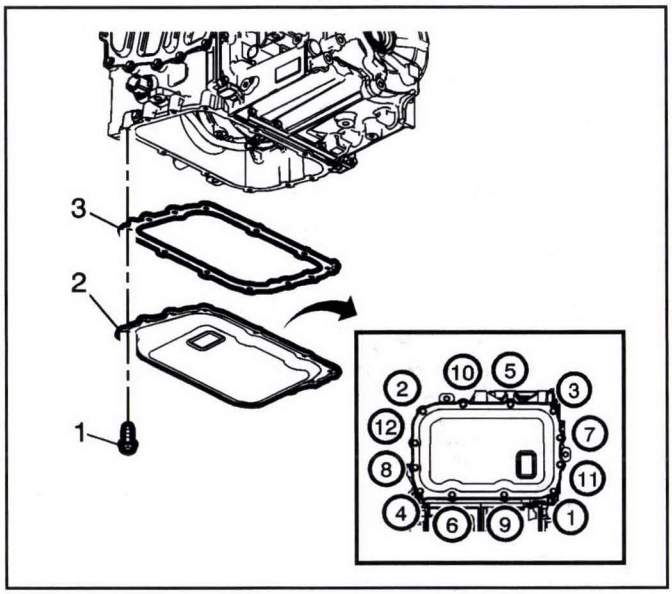
8. Disconnect the fluid temperature sensor (1) from the electrical wiring harness (2).

Installation Procedure

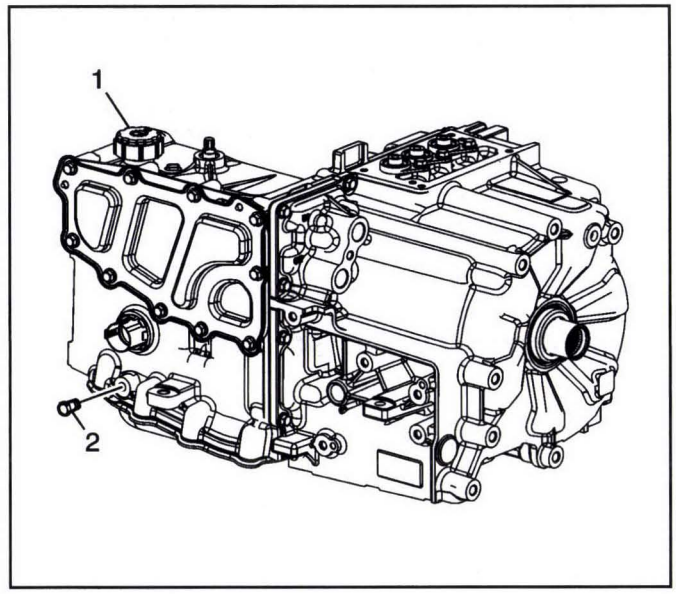


3331766

1. Connect the fluid temperature sensor (1) to the electrical wiring harness (2).
2. Connect the wiring harness to the wiring harness retainer.



3331408



2899111

3. Install the transmission fluid pan gasket (3) to the fluid pan (2),

Caution: Refer to *Fastener Caution on page 0-8*.

4. Install the 12 transmission fluid pan bolts (1), then tighten in the sequence shown to **9** N•m **(80 lb in)**.
5. Remove the drain pan from under the vehicle.
6. Lower the vehicle.
7. Fill the transmission with fluid. Refer to *Adhesives, Fluids, Lubricants, and Sealers on page 16-5* and *Approximate Fluid Capacities on page 16-5*.
8. Enable the high voltage systems. Refer to *High Voltage Enabling on page 9-367*.
9. Check the transmission fluid level. Refer to *Transmission Fluid Level and Condition Check on page 16-28*.
10. Install the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
11. Verify proper operation of the transmission.

Transmission Fluid Drain and Fill

1. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
2. Place a suitable drain pan under the transmission fluid pan.
3. Remove the transmission fluid pan from the transmission to drain the transmission fluid. Refer to *Transmission Fluid Pan Replacement on page 16-40*.

   Note: Replace the fluid pan gasket with a NEW gasket every time the transmission fluid pan is removed.

4. Position a NEW transmission fluid pan gasket to the pan, then install the transmission fluid pan and gasket to the transmission. Refer to *Transmission Fluid Pan and Fluid Pump Installation on page 16-89* for fastener torque and tightening sequence.
5. Using a commercially available hand pump, add transmission fluid through the case fill hole (1). Refer to *Adhesives, Fluids, Lubricants, and Sealers on page 16-5* and *Approximate Fluid Capacities on page 16-5* for fluid specifications and fluid capacity.

Caution: Check the transmission fluid level immediately after adding fluid and before vehicle operation. Do not overfill the transmission. An overfilled transmission may result in foaming or fluid to be expelled out the vent tube when the vehicle is operated. Overfilling will result in possible damage to the transmission.

6. Check the transmission fluid level. Refer to *Transmission Fluid Level and Condition Check on page 16-28*.

   Note: Continue to monitor the transmission fluid temperature, if the fluid temperature falls below the specified range. Operate the vehicle again, until the transmission fluid temperature is reached.

7. Operate the vehicle until transmission fluid temperature is 86–122°F (30–50°C).

   Note: The auxiliary transmission fluid pump must be running when the transmission oil level check plug is removed or excessive fluid loss will occur, resulting in an under-filled condition.

   Note: When the oil level check plug is removed with the auxiliary fluid pump OFF, excessive loss of transmission fluid will occur.

8. Using the scan tool, command the auxiliary transmission fluid pump speed to ON for 10 minutes and keep it running throughout the process.
9. Remove the transmission oil level check plug (2) and verify a light drip of fluid comes out.

Caution: Refer to *Fastener Caution on page 0-8*.

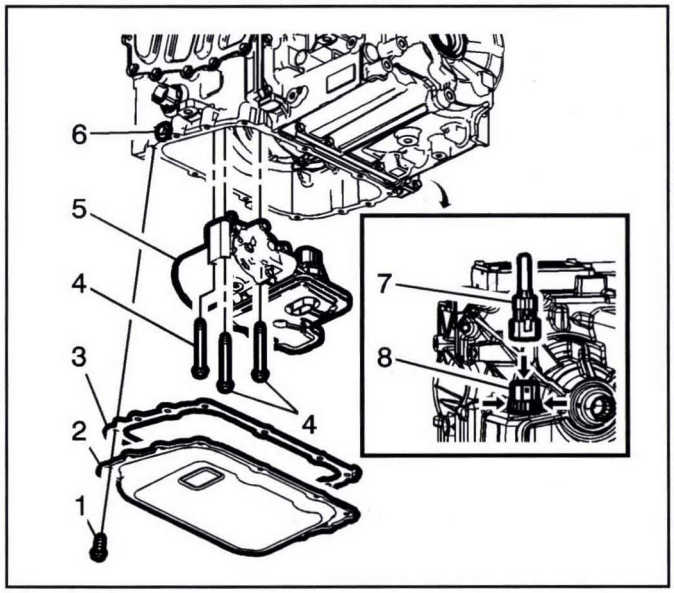
10. Install the transmission oil level check plug (2) and tighten to **12** N•m **(106 lb in)**.
11. Using the scan tool, command the auxiliary transmission fluid pump speed to OFF.

12. Install the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
13. Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

Transmission Fluid Filter Replacement

Removal Procedure

1. Before performing this procedure, review the high voltage safety information. Refer to *High Voltage Safety on page 9-362*.
2. Disable the high voltage systems. Refer to *High Voltage Disabling on page 9-363*.
3. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
4. Place a suitable drain pan under the vehicle.



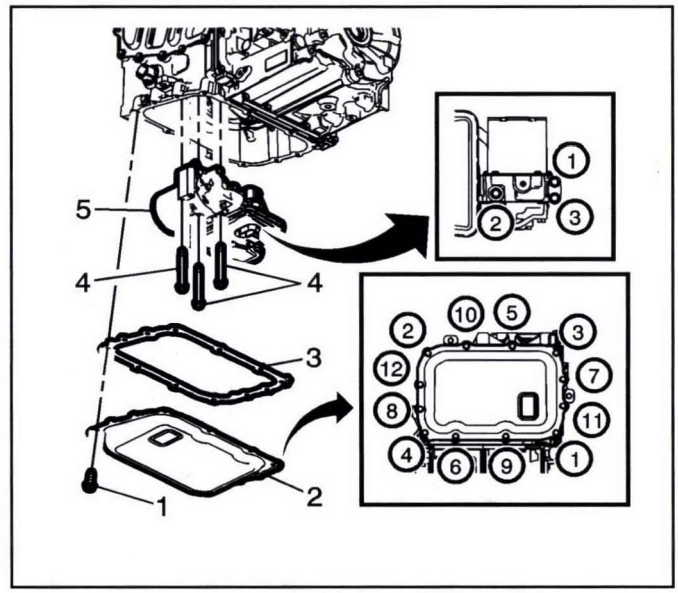
3350389

5. Drain the transmission fluid from the transmission. Refer to *Transmission Fluid Drain and Fill on page 16-42*.
6. Remove the 12 transmission fluid pan bolts (1).
7. Remove the transmission fluid pan (2) and gasket (3).
8. Disconnect the fluid pump motor cable connector (7).
9. Press the locking tabs inward in order to remove the fluid pump motor connector (8) and push down the upper side of connector.
10. Remove the 3 fluid pump bolts (4).
11. Remove the fluid pump (5) from the transmission, then disconnect the electrical connector.
12. Remove the automatic transmission fluid filter bolt from the fluid pump assembly. Refer to *Disassembled Views on page 16-8* for the location of the automatic transmission fluid filter components.
13. Remove the automatic transmission fluid filter from the fluid pump assembly .
14. Remove the automatic transmission fluid filter seal from the fluid pump assembly.

Installation Procedure

Note: The automatic transmission fluid filter seal is reusable. Inspect the seal to determine if it may be reused. If the seal is damaged or worn, it should be replaced.

1. Install the automatic transmission fluid filter seal to the fluid pump assembly. Refer to *Disassembled Views on page 16-8* for the location of the automatic transmission fluid filter components.
2. Install the automatic transmission fluid filter to the fluid pump assembly.
3. Install the automatic transmission fluid filter bolt to the fluid pump assembly.



3144112

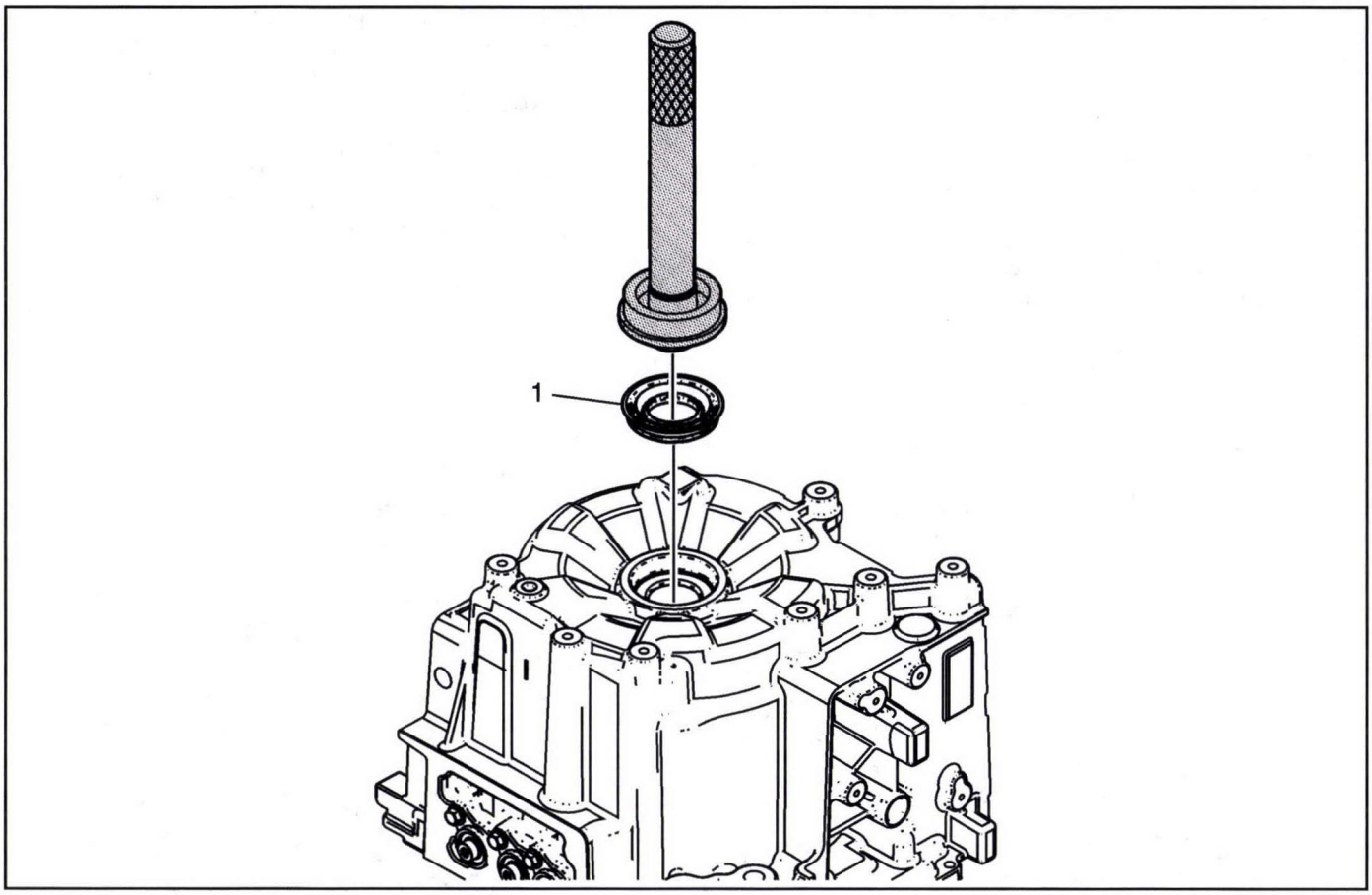
4. Install the fluid pump (5) to the transmission, then connect the electrical connector.

Caution: Refer to *Fastener Caution on page 0-8*.

5. Install the 3 fluid pump bolts (4) bolts, then tighten in the sequence shown to **9** N•m **(80 lb in)**.
6. Install the motor connector into the transmission case and connect the fluid pump motor cable connector.
7. Install the transmission fluid pan gasket (3) to the fluid pan (2).
8. Position the transmission fluid pan (2) and fluid pan gasket (3) to the transmission.
9. Install the 12 transmission fluid pan bolts (1), then tighten in the sequence shown to **9** N•m **(80 lb in)**.
10. Remove the drain pan from under the vehicle.
11. Enable the high voltage systems. Refer to *High Voltage Enabling on page 9-367*.
12. Fill the transmission with fluid. Refer to *Transmission Fluid Drain and Fill on page 16-42*.

13. Install the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
14. Lower the vehicle.
15. Verify proper operation of the transmission.

Front Wheel Drive Shaft Seal Replacement - Left Side

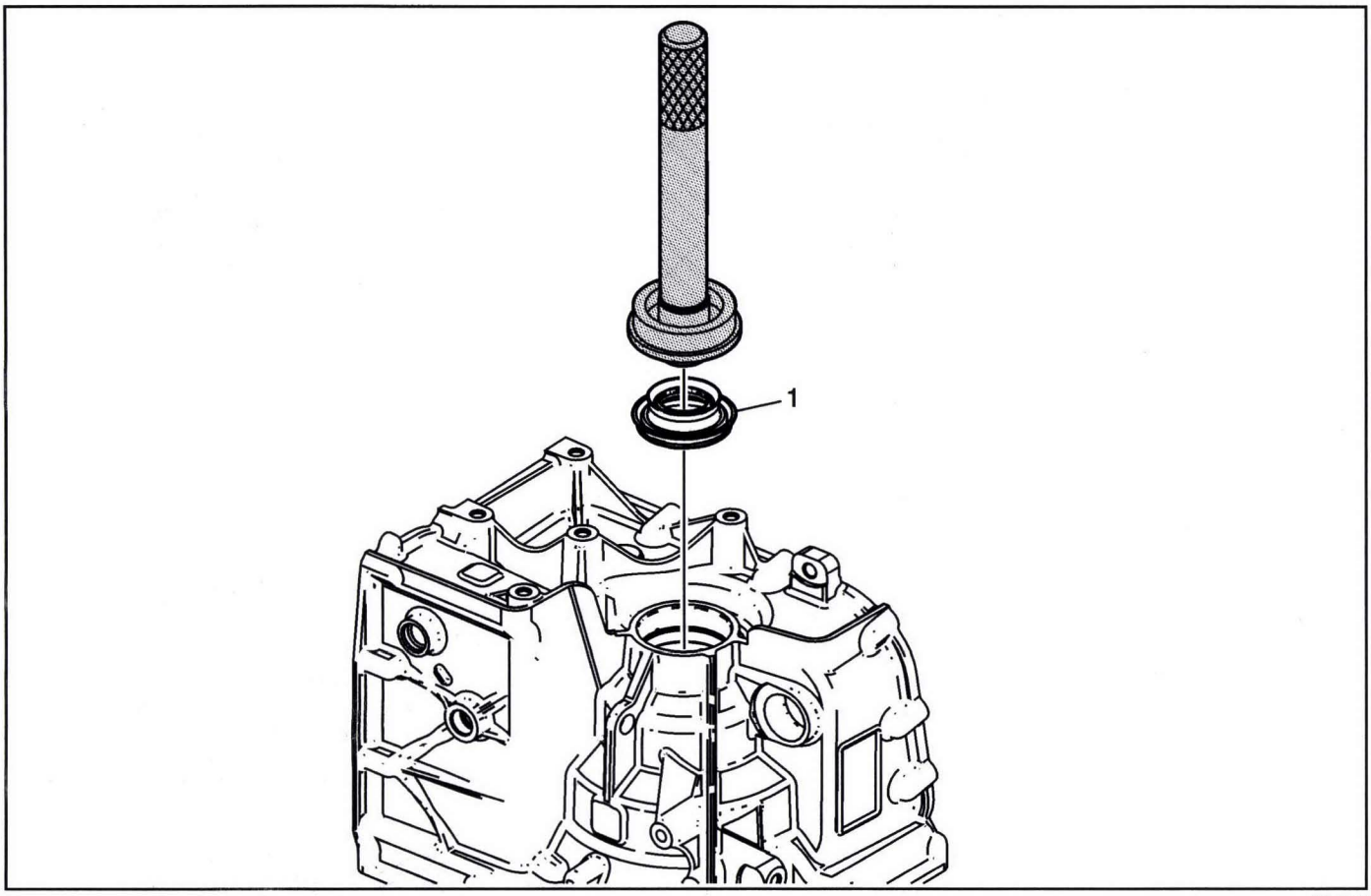


3401631

Front Wheel Drive Shaft Seal Replacement - Left Side

Callout	Component Name
Preliminary Procedures 1. Raise the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Remove the left wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement - Left Side on page 7-4*.	
1	Left Front Wheel Drive Shaft Oil Seal **Note:** • For seal removal use *GE-23907–1* hammer with *DT-23129* remover. • For seal installation use *GE-8092* handle with *DT-46629* installer. **Special Tools** • *DT-46629* Axle Seal Installer • *GE-23907–1* Slide Hammer with Shaft • *GE-8092* Driver Handle • *DT-23129* Universal Seal Remover For equivalent regional tools, refer to *Special Tools on page 16-96*.

Front Wheel Drive Shaft Seal Replacement - Right Side



2899189

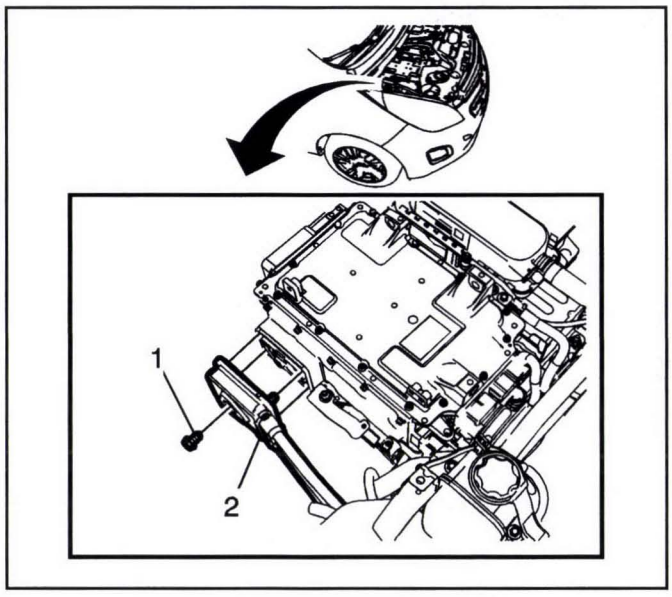
Front Wheel Drive Shaft Seal Replacement - Right Side

Callout	Component Name
Preliminary Procedures 1. Raise the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-27*. 2. Remove the left wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement - Left Side on page 7-4*.	
1	Left Front Wheel Drive Shaft Oil Seal **Note:** • For seal removal use *GE-23907–1* hammer with *DT-23129* remover. • For seal installation use *GE-8092* handle with *DT-46629* installer. **Special Tools** • *DT-46629* Axle Seal Installer • *GE-23907–1* Slide Hammer with Shaft • *GE-8092* Driver Handle • *DT-23129* Universal Seal Remover For equivalent regional tools, refer to *Special Tools on page 16-96*.

Drive Motor Replacement

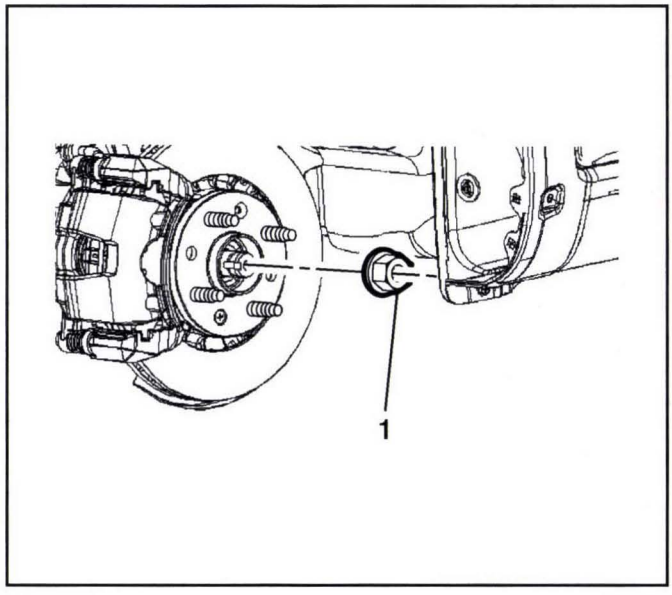
Removal Procedure

1. Before performing this procedure, review the high voltage safety information. Refer to *High Voltage Safety on page 9-362*.
2. Disable the high voltage systems. Refer to *High Voltage Disabling on page 9-363*.



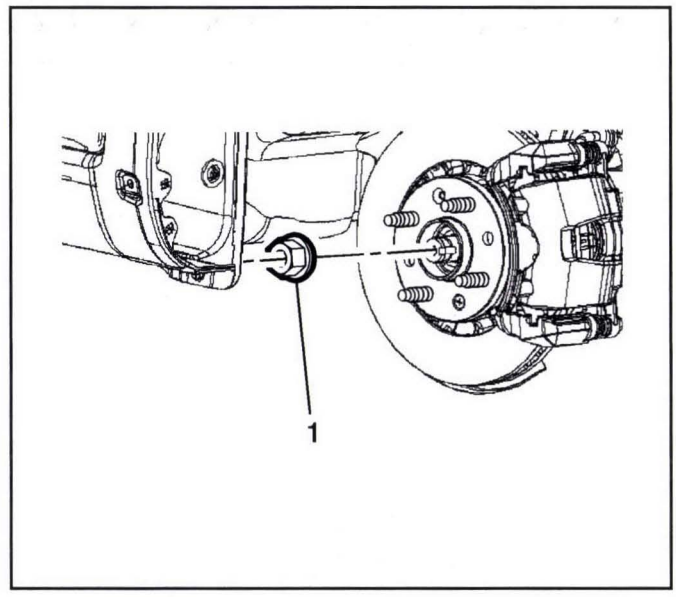
3232258

3. Remove the fastener (1) and disconnect the transmission 3 phase connector (2) from the drive motor generator power inverter module and move aside the cables.
4. Discard the 3 phase connector seal.
5. Drain the transmission fluid. Refer to *Transmission Fluid Drain and Fill on page 16-42*.



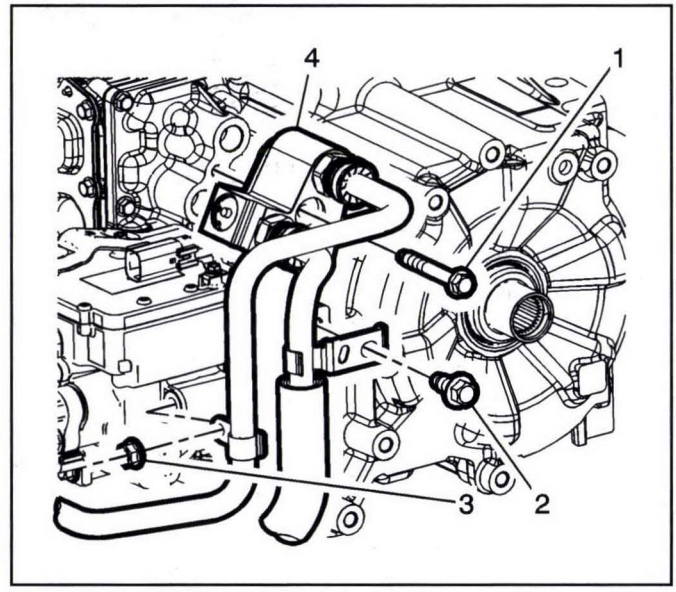
3327119

6. Remove the left front wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement - Left Side on page 7-4*.



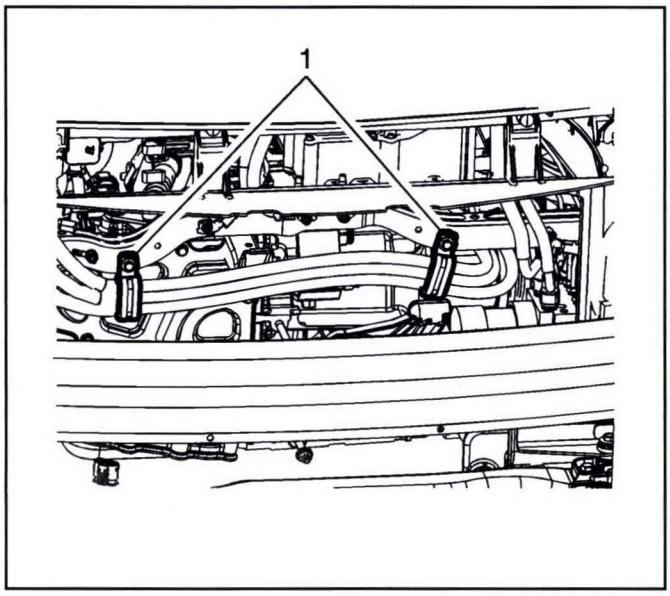
3327121

7. Remove the right front wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement - Right Side on page 7-7*.
8. Remove air conditioning compressor from the drive unit. Refer to *Air Conditioning Compressor Replacement on page 10-26*.



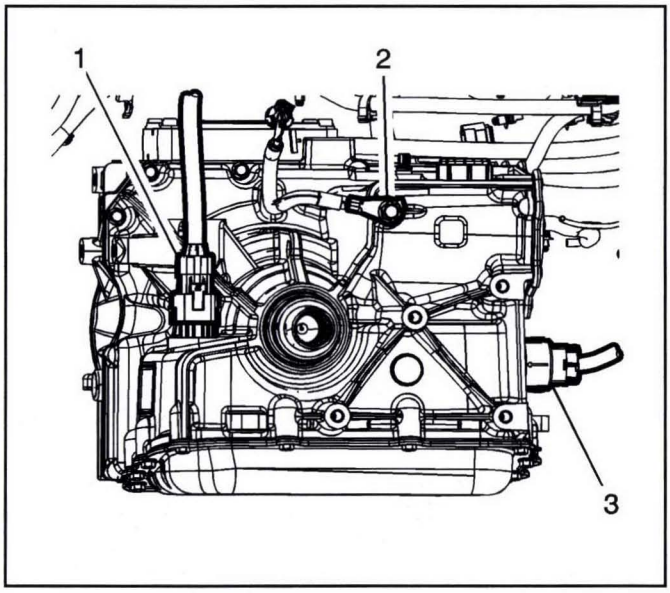
3351604

9. Remove the transmission fluid cooler bypass valve bolt (1) and cooler inlet pipe mounting bolt (2).
10. Remove the cooler outlet pipe mounting bolt (3).
11. Without disconnecting the pipes from the bypass valve, position aside the bypass valve (4) from the drive unit.



3121919

12. Remove the high voltage cable retainer fasteners, then position the cables on the drive module assembly.

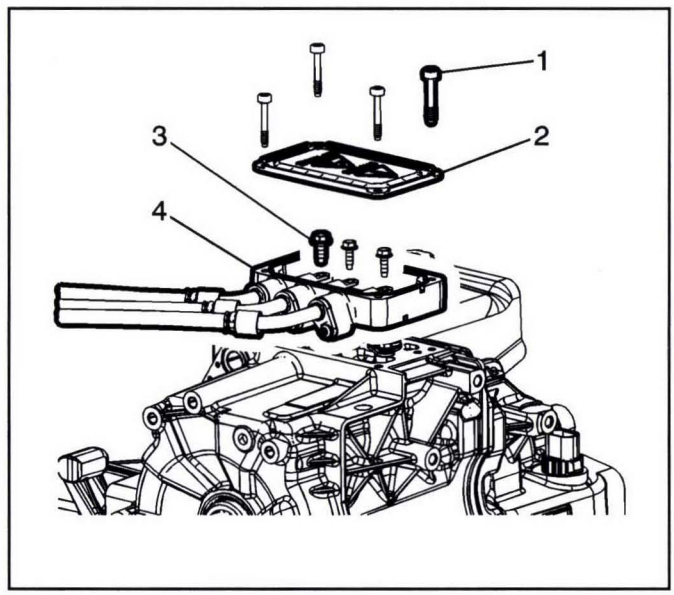


3351605

13. Disconnect the transmission fluid pump connector (1) and ground bolt (2) from the front of the transmission.
14. Disconnect the transmission control connector (3).

    Note: There is a internal resolver electrical connector (white 6 - wire) between the drive motor assembly and the transmission. This connector is accessed inside the transmission above the fluid pump.
15. Remove the fluid pump from the transmission. Refer to *Transmission Fluid Pump Replacement on page 16-39*.
16. Reaching inside the transmission, disconnect the resolver electrical connector.
17. Support the drive unit and transmission using a suitable support table.

    Note: During the drive motor removal,the vehicle weight will be redistributed and may cause the vehicle to become unstable on the hoist.
18. Position suitable jacks under each of the rear spring pads.
19. Remove the rear transmission mount bracket. Refer to *Transmission Rear Mount Bracket Replacement on page 16-50*.
20. Disconnect the range selector lever cable from transmission. Refer to *Range Selector Lever Cable Replacement on page 16-36*.
21. Remove the left side transmission mount. Refer to *Transmission Mount Replacement - Left Side on page 16-52*.
22. Remove the right side transmission mount. Refer to *Transmission Mount Replacement - Right Side on page 16-53*.
23. Lower the transmission and drive unit assembly from the vehicle.



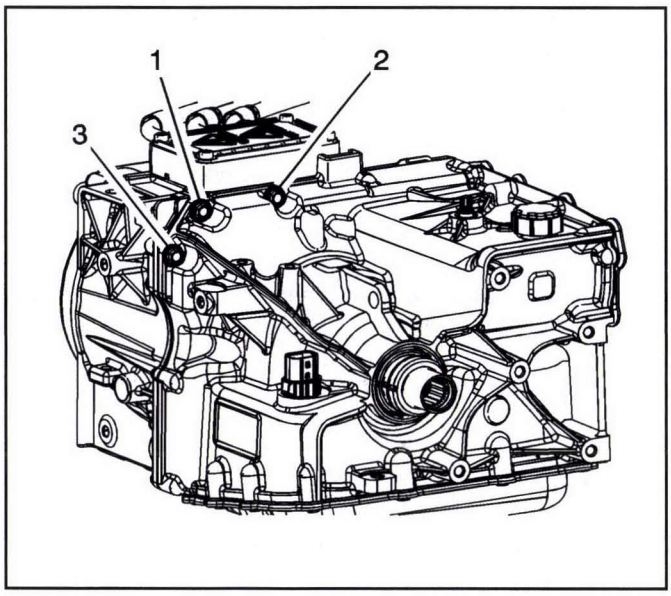
3351618

24. Remove the 3 phase cable assembly cover bolts (1) and the cable cover (2).
25. Remove the 3 drive motor power inverter module connector bolts (3).
26. Remove the drive motor power inverter module connector assembly (4) from the transmission and DISCARD the connector seal.
27. Remove the thirteen fasteners retaining the transmission to the drive unit.

    Note: Ensure the resolver connector is disconnected, see Steps 14 and 15.
28. Separate the transmission from the drive unit.
29. Remove the gasket, clean the mating surfaces as necessary.

Installation Procedure

1. Install a New gasket to the transmission.
2. Position the transmission to the drive unit.



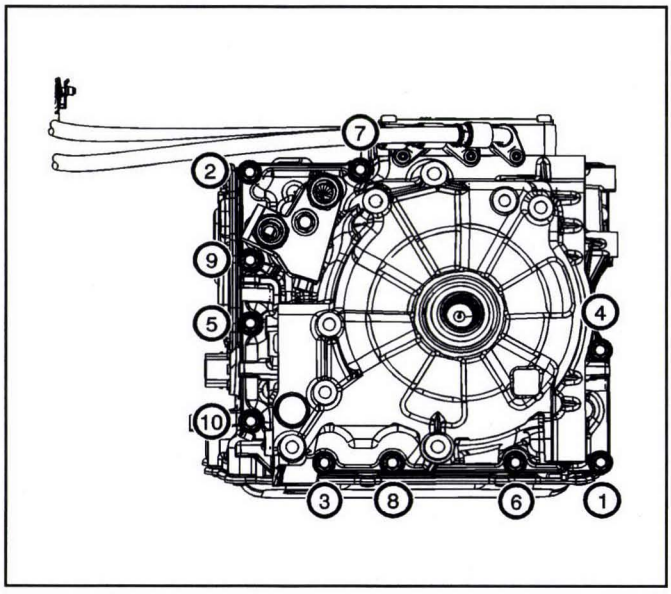
3212226

Caution: Refer to *Fastener Caution on page 0-8*.

3. Install the three fasteners.

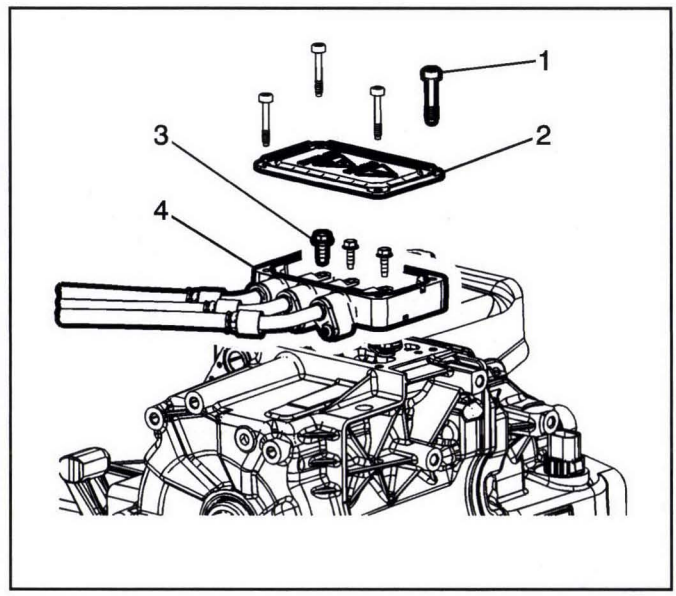
   Tighten

   - Bolt (1) to **9** N•m **(80 lb in)**
   - Bolt (2) to **9** N•m **(80 lb in)**
   - Bolt (3) to **9** N•m **(80 lb in)**



3212227

4. Install the ten fasteners in the sequence shown, and tighten to **9** N•m **(80 lb in)**.



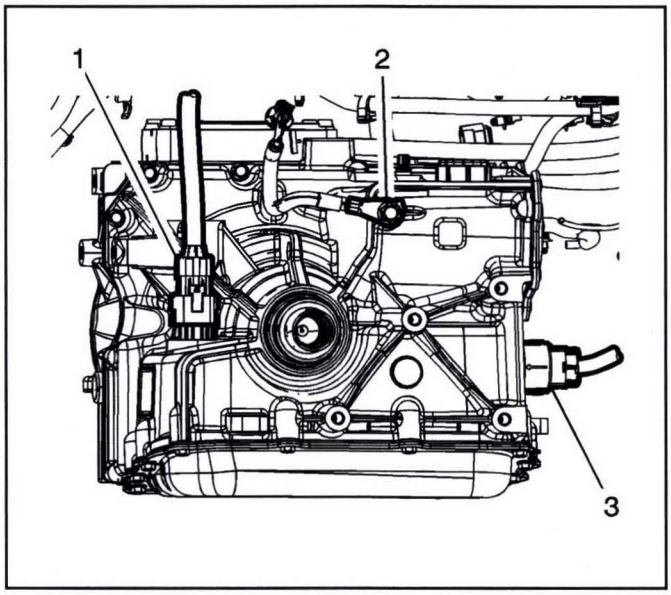
3351618

Note: A NEW seal must be installed every time the drive motor power inverter module connector has been disconnected.

5. Install the drive motor power inverter module connector assembly (4) onto the transmission with a NEW seal.
6. Install the 3 drive motor power inverter module connector bolts (3) and tighten to **9** N•m **(80 lb in)**.
7. Install the 3 phase cable assembly cover bolts (1) into the cable cover (2) with a NEW cover seal and tighten to **9** N•m **(80 lb in)**.
8. Raise the transmission and drive unit assembly into the vehicle.
9. Install the left side transmission mount. Refer to *Transmission Mount Replacement - Left Side on page 16-52*.
10. Install the right side transmission mount. Refer to *Transmission Mount Replacement - Right Side on page 16-53*.
11. Connect the range selector lever cable onto transmission. Refer to *Range Selector Lever Cable Replacement on page 16-36*.
12. Install the rear transmission mount bracket. Refer to *Transmission Rear Mount Bracket Replacement on page 16-50*.
13. Remove the support table.
14. Remove the jacks from each of the rear spring pads.

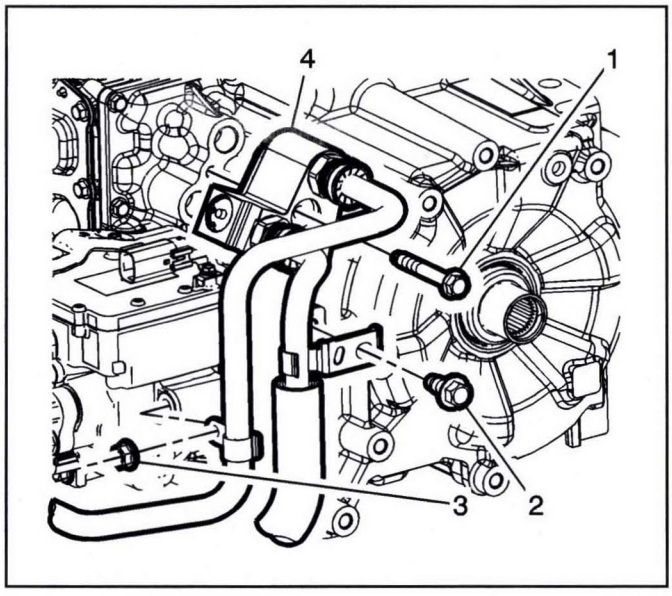
    Note: There is a internal resolver electrical connector (white 6 - wire) between the drive motor assembly and the transmission. This connector is accessed inside the transmission above the fluid pump.

15. Reaching inside the transmission, connect the resolver electrical connector.
16. Install the fluid pump in the transmission. Refer to *Transmission Fluid Pump Replacement on page 16-39*.



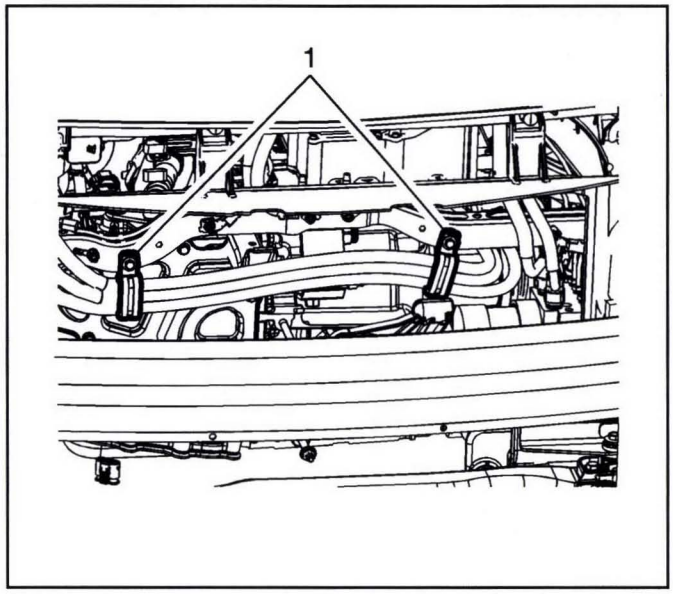
3351605

17. Connect the transmission fluid pump connector (1) to the rear of the transmission.
18. Install the ground cable bolt (2) and tighten to **40** N•m **(30 lb ft)**.
19. Connect the transmission fluid pump connector (3) to the rear of the transmission.



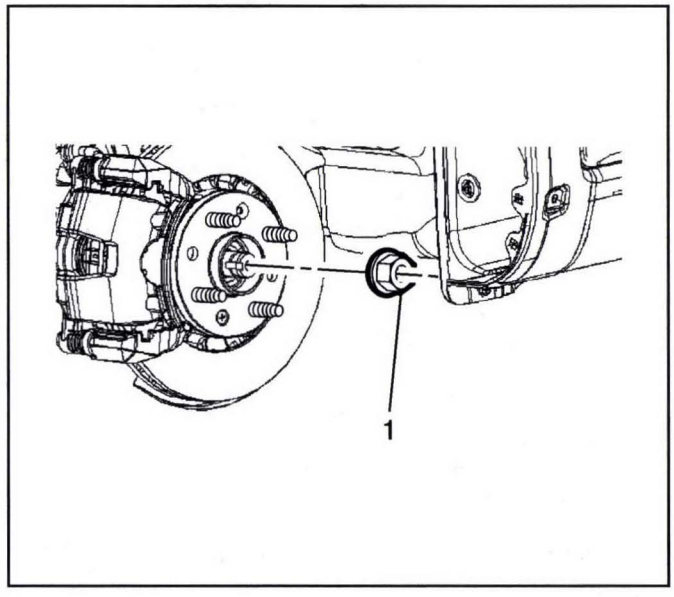
3351604

20. Install the transmission fluid cooler bypass valve bolt (1) and tighten to **22** N•m **(16 lb ft)**.
21. Install the cooler inlet pipe mounting bolt (2) and tighten to **30** N•m **(22 lb ft)**.
22. Install the cooler outlet pipe mounting bolt (3) and tighten to **23** N•m **(17 lb ft)**.



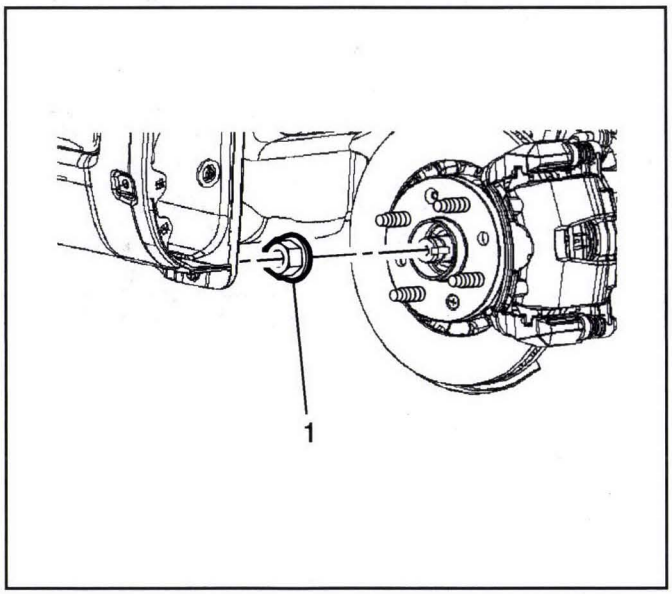
3121919

23. Install the high voltage cable retainer fasteners, then tighten the retaining bolts (1) to **9** N•m **(80 lb in)**.
24. Install air conditioning compressor to the drive unit. Refer to *Air Conditioning Compressor Replacement on page 10-26*.



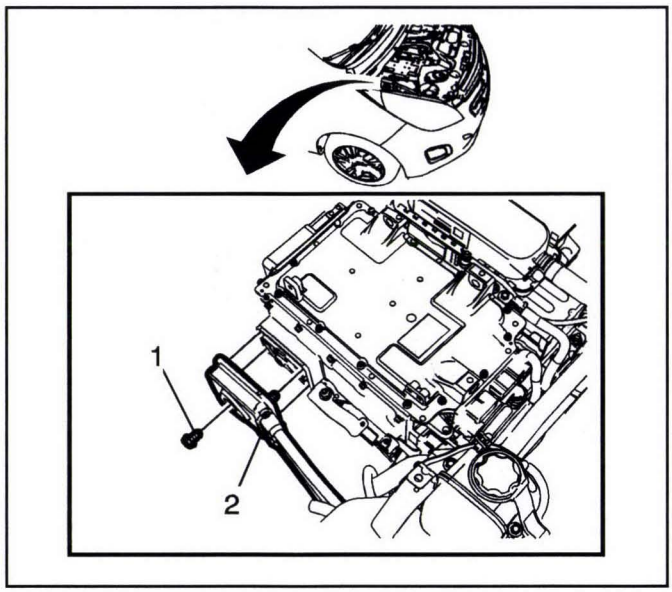
3327119

25. Install the left front wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement - Left Side on page 7-4*.



3327121

26. Install the right front wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement - Right Side on page 7-7*.



3232258

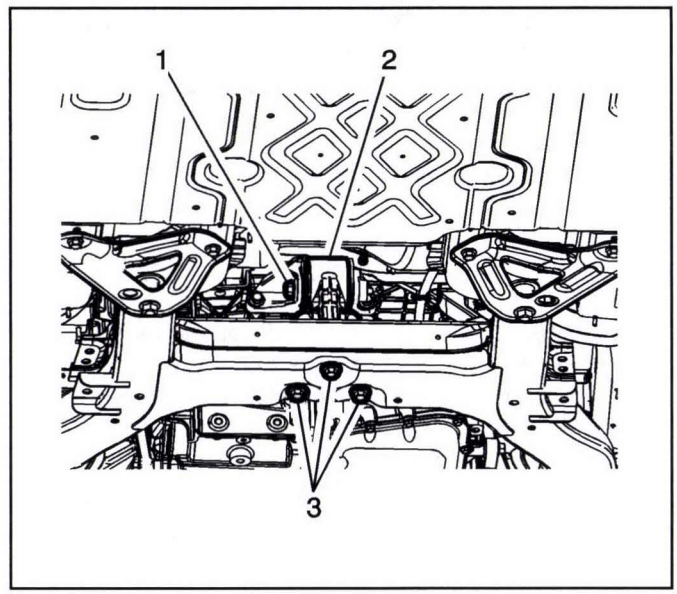
Note: A NEW seal must be installed every time the 3 phase high voltage cable connector has been disconnected.

27. Install a NEW 3 phase connector seal to the connector (2).
28. Install the 3 phase high voltage cable connector onto the drive motor generator power inverter module, then tighten the cable connector bolts (1) to **9 N•m (80 lb in)**.
29. Enable the high voltage systems. Refer to *High Voltage Enabling on page 9-367*.
30. Fill the transmission with transmission fluid. Refer to *Transmission Fluid Drain and Fill on page 16-42*.
31. Verify proper operation of the transmission.

Transmission Rear Mount Bracket Replacement

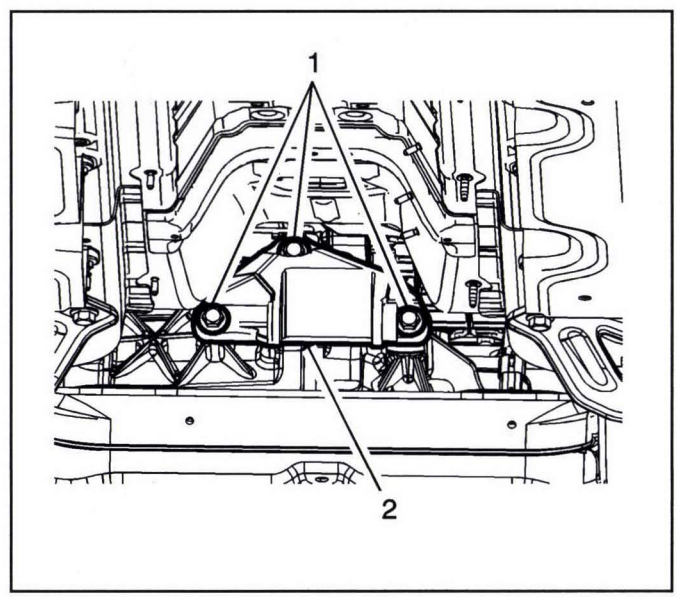
Removal Procedure

1. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
2. Support the transmission with a suitable jack stand.



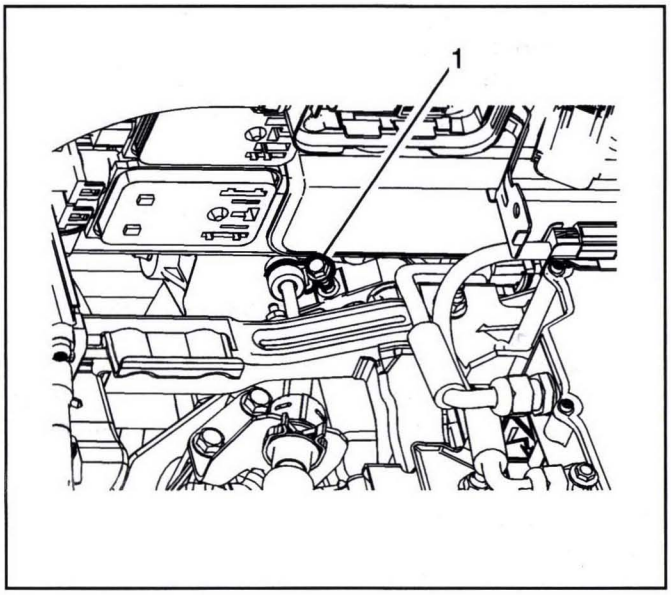
3137500

3. Remove the rear mount strut (2). Refer to *Transmission Mount Strut Replacement - Rear on page 16-52*.



3139653

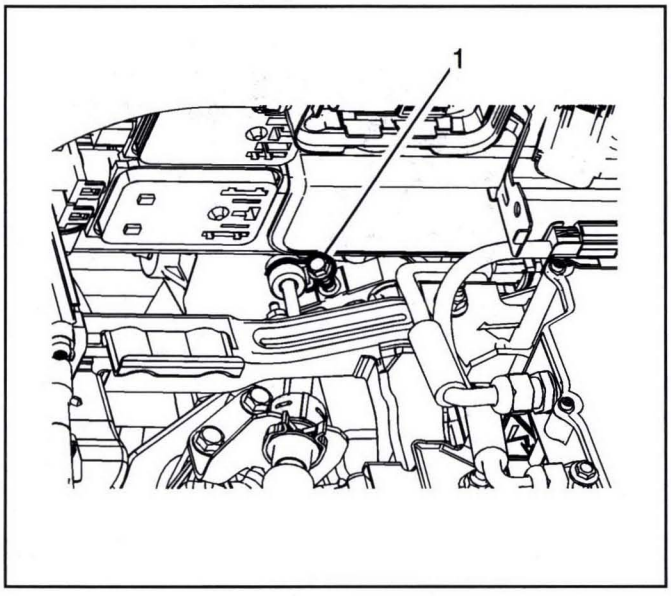
4. Remove the transmission rear mount bracket to transmission bolts (1).



3032970

5. Remove the shift cable retaining bolt (1) from the rear transmission mount bracket.
6. Remove the rear mount bracket (2) from the vehicle.

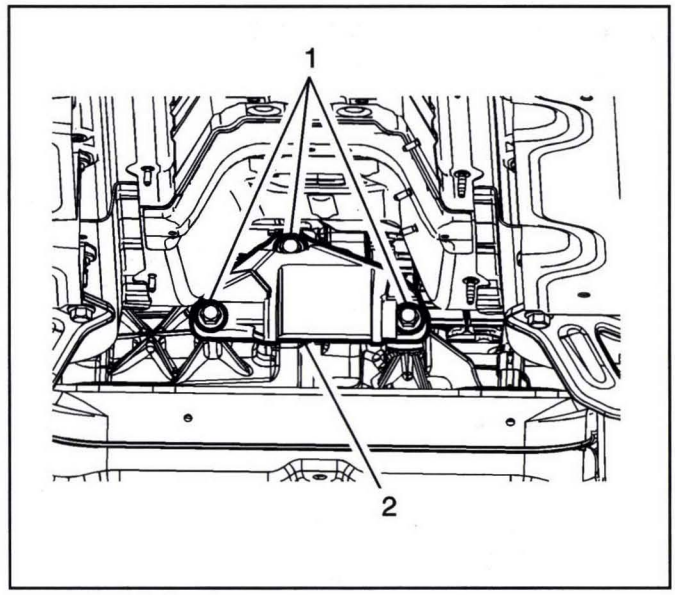
Installation Procedure



3032970

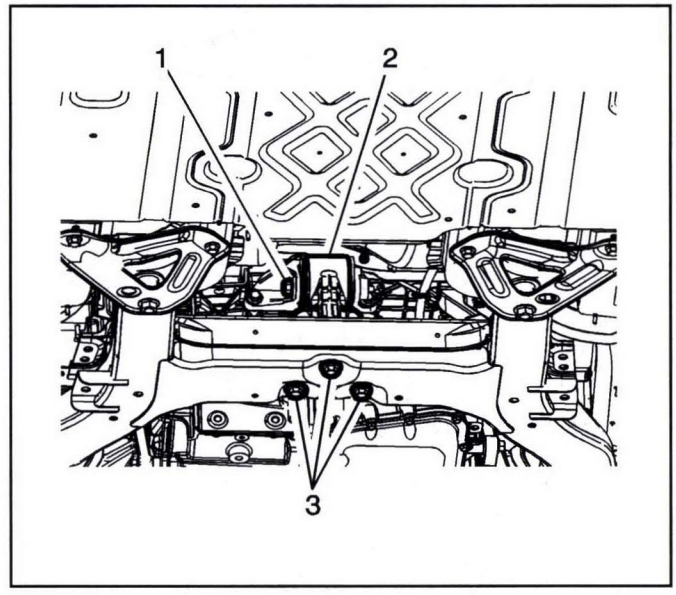
Caution: Refer to *Fastener Caution on page 0-8*.

1. Install the shift cable retaining bolt (1) to the rear transmission mount bracket and tighten to 9 N•m (80 lb in).



3139653

2. Position the rear mount bracket (2) to the transmission.
3. Install the rear mount bracket to transmission bolts (1), then tighten to **65 N•m (48 lb ft)**.



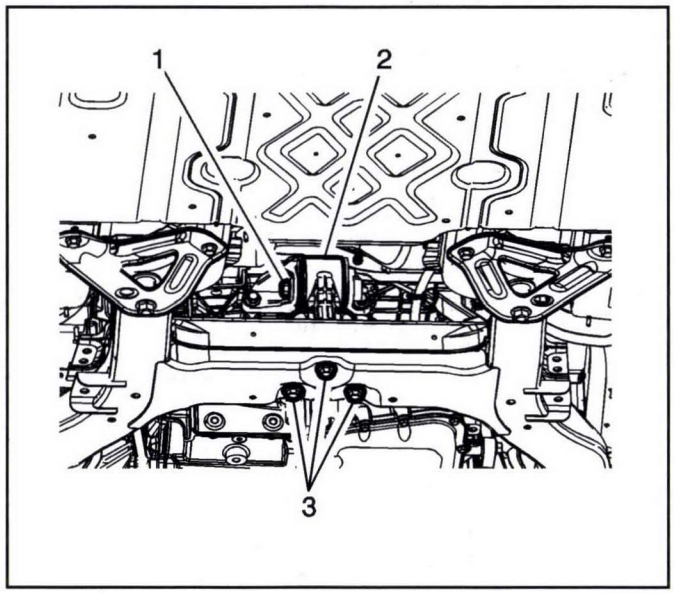
3137500

4. Install the rear mount strut (2). Refer to *Transmission Mount Strut Replacement - Rear on page 16-52*.
5. Remove the jack stand.
6. Install the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.

Transmission Mount Strut Replacement - Rear

Removal Procedure

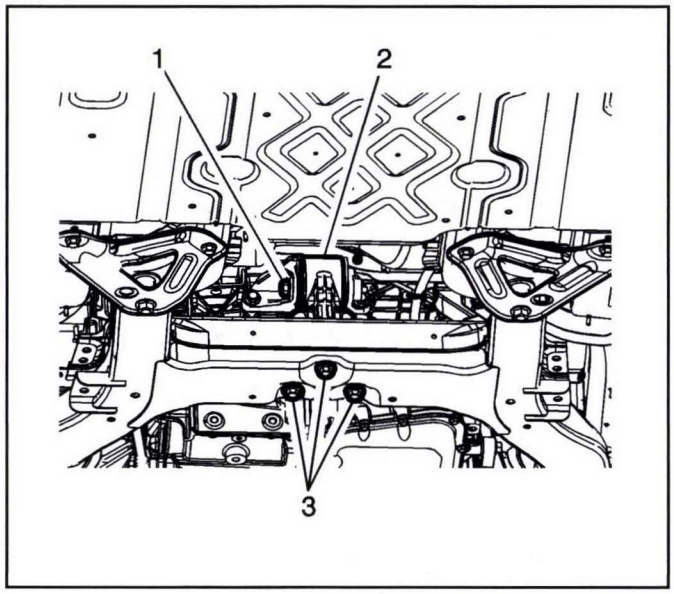
1. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
2. Remove the underbody front air deflector. Refer to *Underbody Front Air Deflector Replacement (Center) on page 3-126*.
3. Support the transmission with a suitable jack stand.



3137500

4. Remove and Discard rear mount strut through bolt (1).
5. Remove the rear mount strut to frame bolts (3).
6. Remove the rear mount strut (2) from the vehicle.

Installation Procedure



3137500

1. Position the rear mount strut (2) to the transmission rear mount bracket.

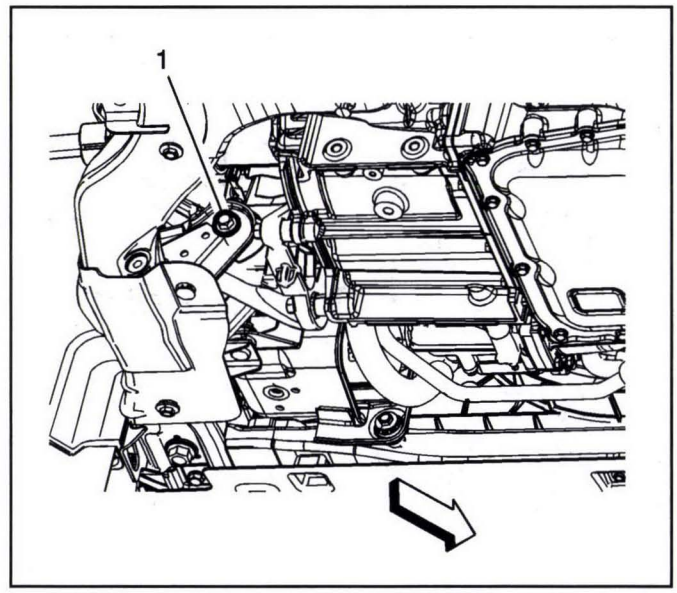
Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the rear mount strut to frame bolts (3), then tighten to **65** N•m **(48 lb ft)**.
3. Install the New rear mount strut through bolt (1), then tighten to **50** N•m **(37 lb ft) plus 60–75 degrees**.
4. Remove the jack stand.
5. Install the underbody front air deflector. Refer to *Underbody Front Air Deflector Replacement (Center) on page 3-126*.
6. Install the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.

Transmission Mount Replacement - Left Side

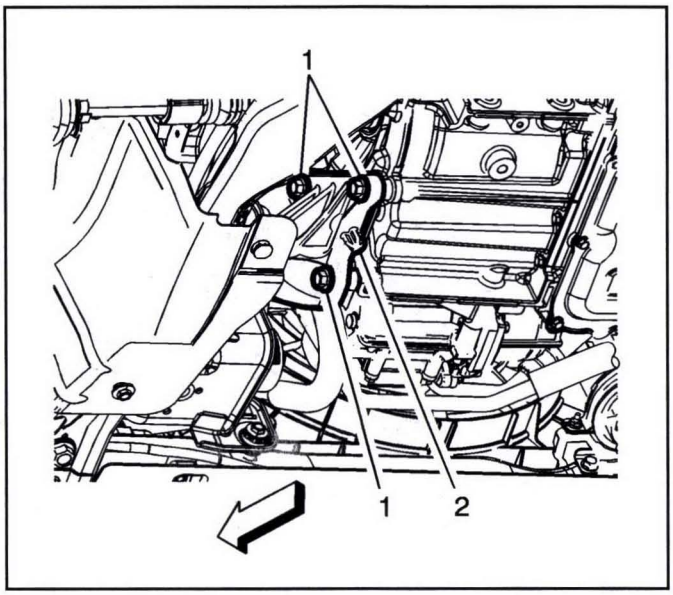
Removal Procedure

1. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
2. Support the drive motor unit with a suitable jack stand.



3102988

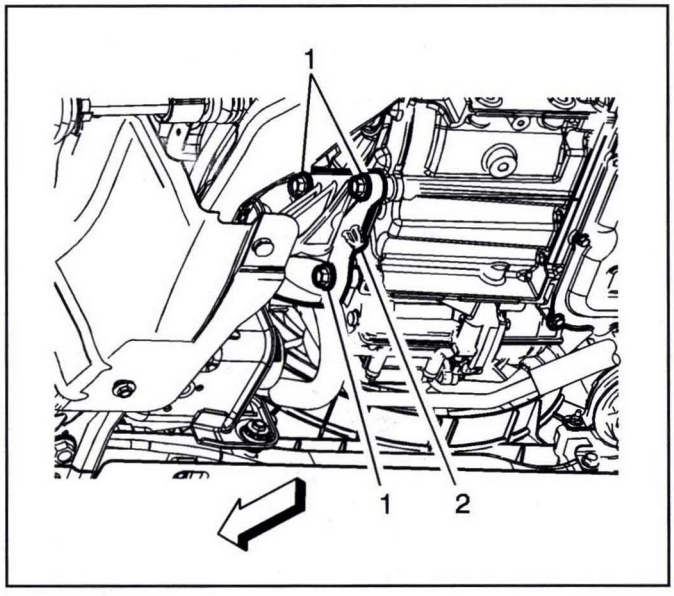
3. Remove left mount through bolt (1).



3102999

4. Remove the left mount to drive motor unit bolts (1).
5. Remove the left mount (2) from the drive motor unit.

Installation Procedure

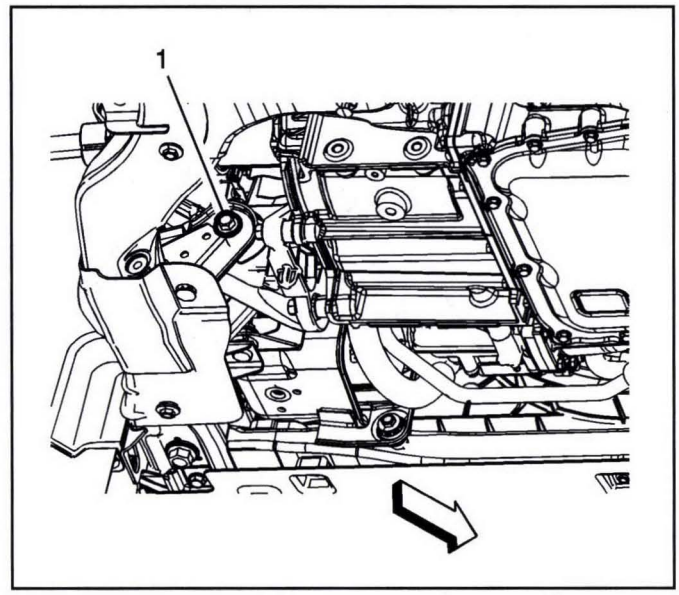


3102999

1. Position the left mount to the drive motor unit (2)

Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the left mount to drive motor unit retaining bolts (1), then tighten to **65 N•m (48 lb ft)**.



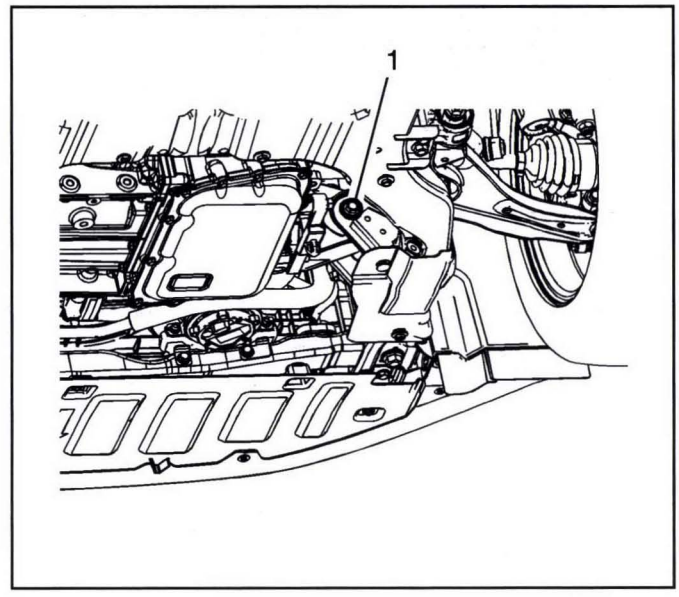
3102988

3. Install the left mount through bolt (1), then tighten to **50 N•m (37 lb ft) plus 60–75 degrees**.
4. Remove the jack stand.
5. Install the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.

Transmission Mount Replacement - Right Side

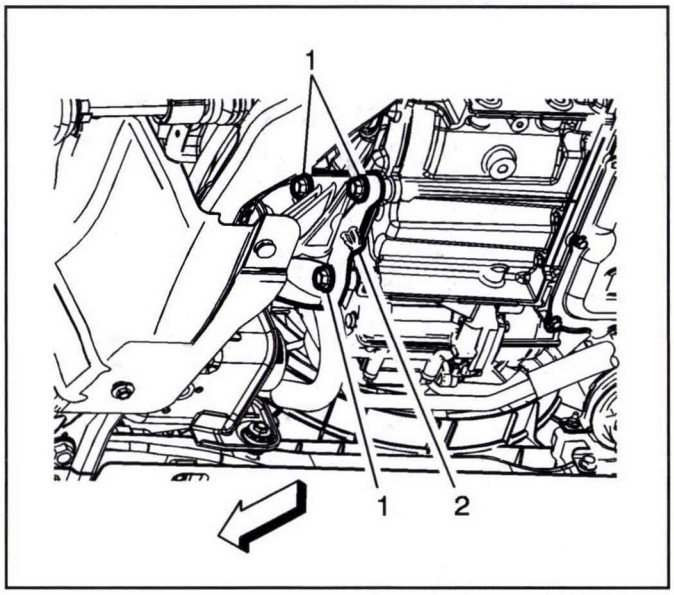
Removal Procedure

1. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.
2. Support the transmission with a suitable jack stand.



3104052

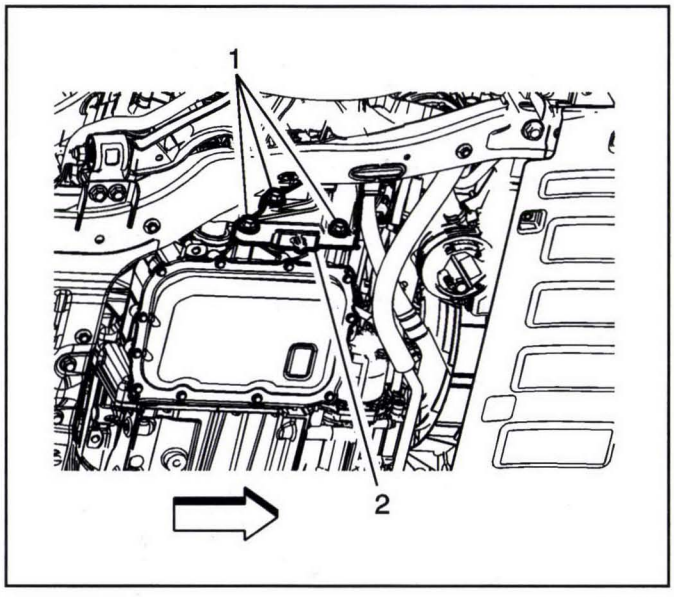
3. Remove right mount through bolt (1).



3102999

4. Remove the right mount to transmission bolts (1).
5. Remove the right mount (2) from the transmission.

Installation Procedure

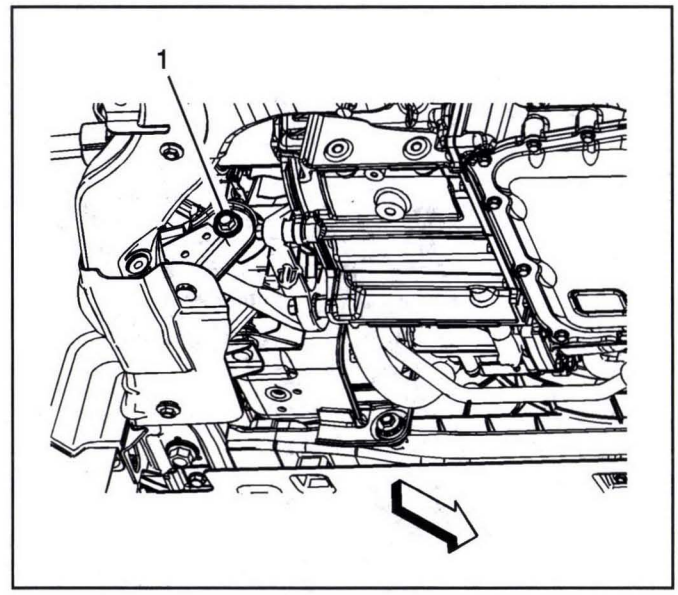


3104057

1. Position the right mount (2) to the transmission.

Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the right mount to transmission bolts (1), then tighten to **65** N•m **(48 lb ft)**.



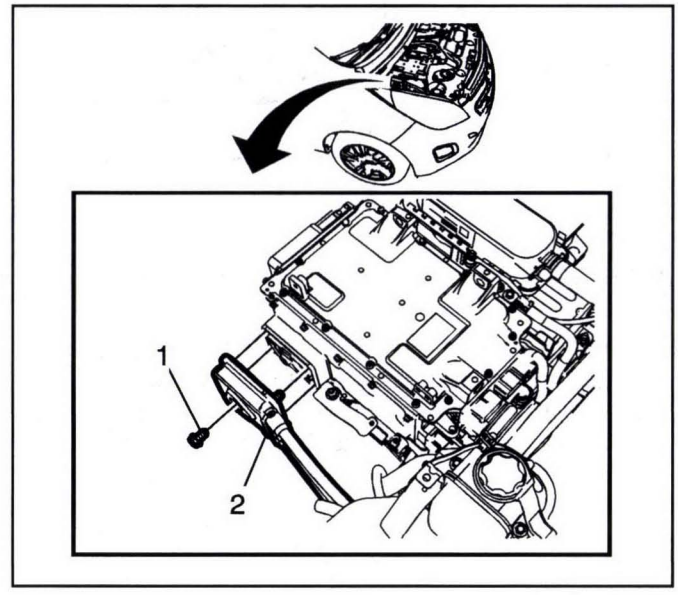
3102988

3. Install the right mount through bolt (1), then tighten to **50** N•m **(37 lb ft) plus 60–75 degrees**.
4. Remove the jack stand.
5. Install the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*.

Transmission Replacement

Removal Procedure

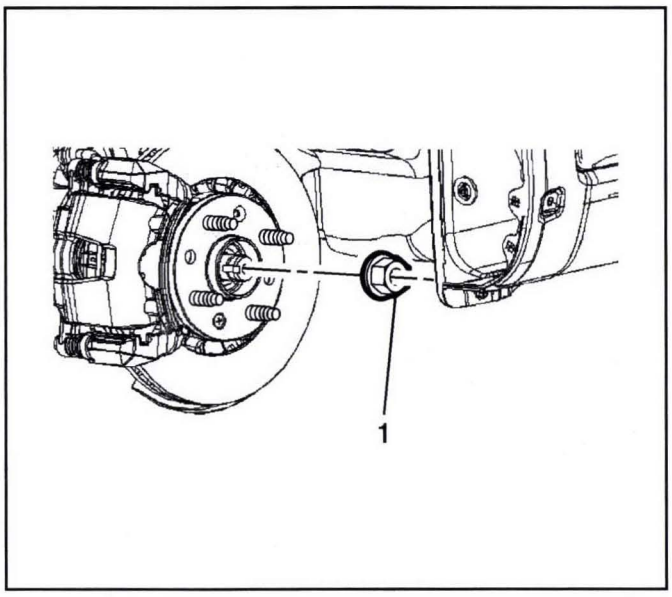
1. Before performing this procedure, review the high voltage safety information. Refer to *High Voltage Safety on page 9-362*.
2. Disable the high voltage systems. Refer to *High Voltage Disabling on page 9-363*.



3232258

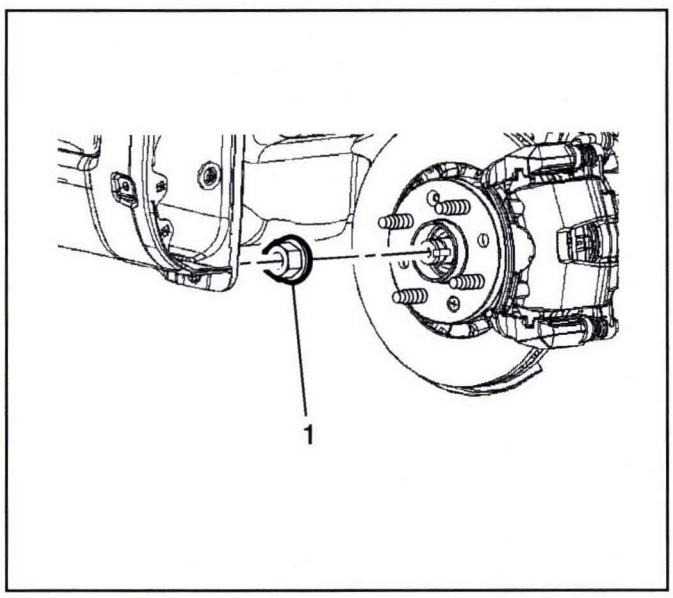
3. Remove the fastener (1) and disconnect the transmission 3 phase connector (2) from the drive motor generator power inverter module and move aside the cables.

4. Discard the 3 phase connector seal.
5. Drain the transmission fluid. Refer to *Transmission Fluid Drain and Fill on page 16-42*.



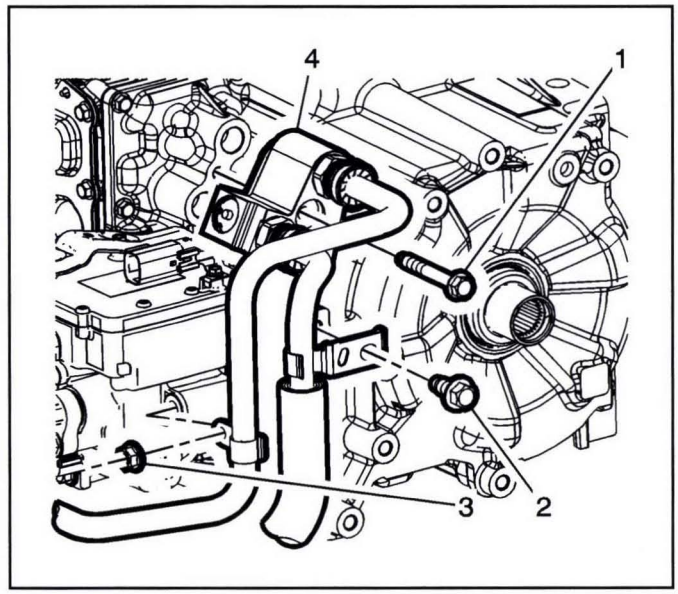
3327119

6. Remove the left front wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement - Left Side on page 7-4*.



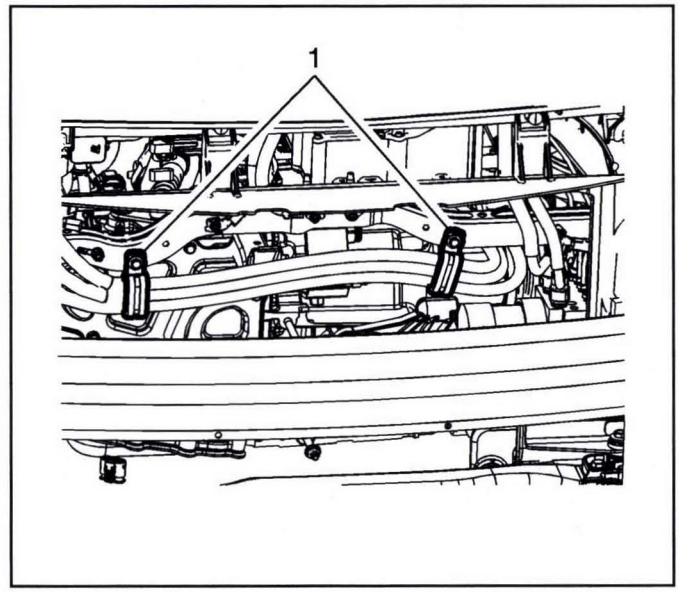
3327121

7. Remove the right front wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement - Right Side on page 7-7*.
8. Remove air conditioning compressor from the drive unit. Refer to *Air Conditioning Compressor Replacement on page 10-26*.



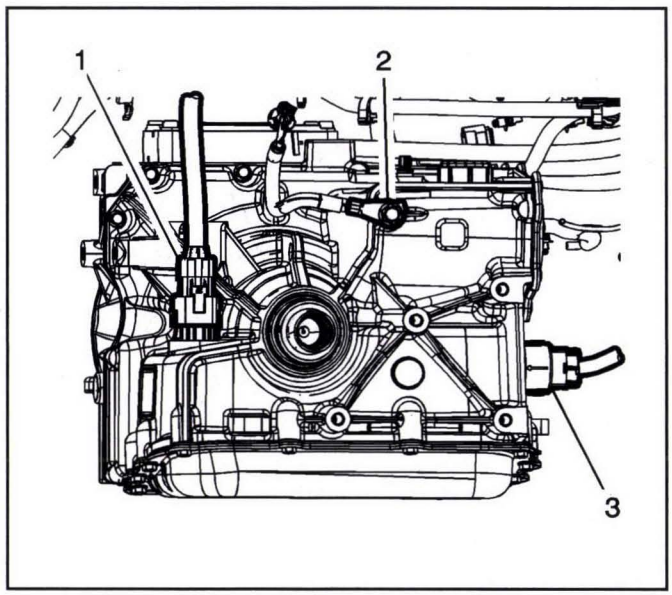
3351604

9. Remove the transmission fluid cooler bypass valve bolt (1) and cooler inlet pipe mounting bolt (2).
10. Remove the cooler outlet pipe mounting bolt (3).
11. Without disconnecting the pipes from the bypass valve, position aside the bypass valve (4) from the drive unit.

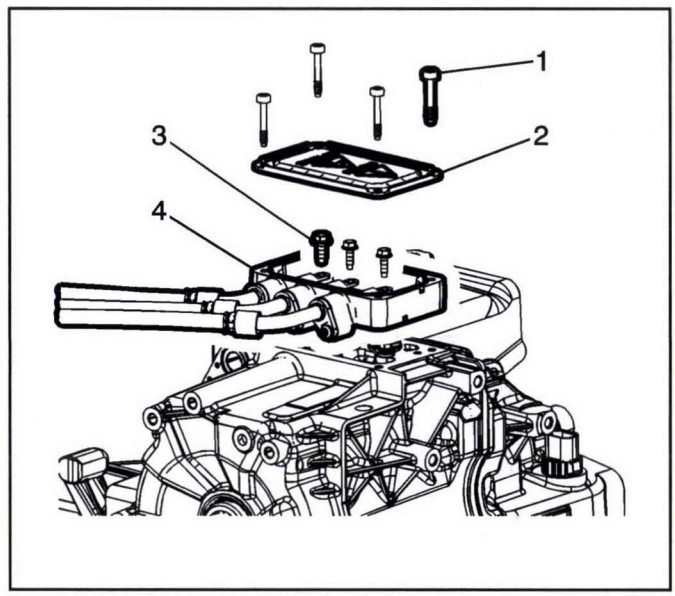


3121919

12. Remove the high voltage cable retainer fasteners, then position the cables on the drive module assembly.



3351605



3351618

13. Disconnect the transmission fluid pump connector (1) and ground bolt (2) from the front of the transmission.
14. Disconnect the transmission control connector (3).

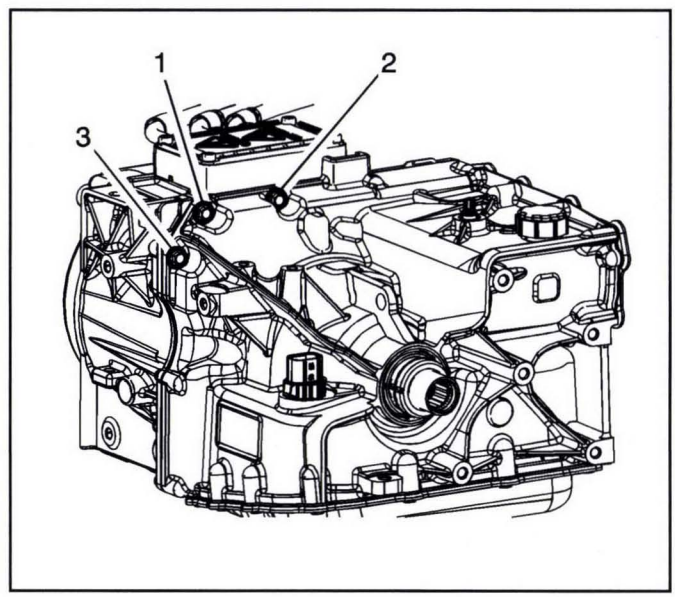
    Note: There is a internal resolver electrical connector (white 6 - wire) between the drive motor assembly and the transmission. This connector is accessed inside the transmission above the fluid pump.
15. Remove the fluid pump from the transmission. Refer to *Transmission Fluid Pump Replacement on page 16-39*.
16. Reaching inside the transmission, disconnect the resolver electrical connector.
17. Support the drive unit and transmission using a suitable support table.

    Note: During the drive motor removal,the vehicle weight will be redistributed and may cause the vehicle to become unstable on the hoist.
18. Position suitable jacks under each of the rear spring pads.
19. Remove the rear transmission mount bracket. Refer to *Transmission Rear Mount Bracket Replacement on page 16-50*.
20. Disconnect the range selector lever cable from transmission. Refer to *Range Selector Lever Cable Replacement on page 16-36*.
21. Remove the left side transmission mount. Refer to *Transmission Mount Replacement - Left Side on page 16-52*.
22. Remove the right side transmission mount. Refer to *Transmission Mount Replacement - Right Side on page 16-53*.
23. Lower the transmission and drive unit assembly from the vehicle.
24. Remove the 3 phase cable assembly cover bolts (1) and the cable cover (2).
25. Remove the 3 drive motor power inverter module connector bolts (3).
26. Remove the drive motor power inverter module connector assembly (4) from the transmission and DISCARD the connector seal.
27. Remove the thirteen fasteners retaining the transmission to the drive unit.

    Note: Ensure the resolver connector is disconnected, see Steps 14 and 15.
28. Separate the transmission from the drive unit.
29. Remove the gasket, clean the mating surfaces as necessary.

Installation Procedure

1. Install a New gasket to the transmission.
2. Position the transmission to the drive unit.



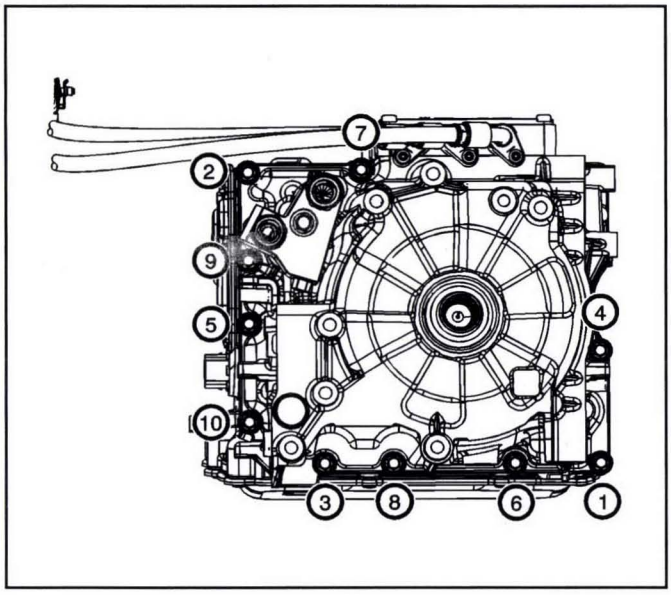
3212226

Caution: Refer to *Fastener Caution on page 0-8*.

3. Install the three fasteners.

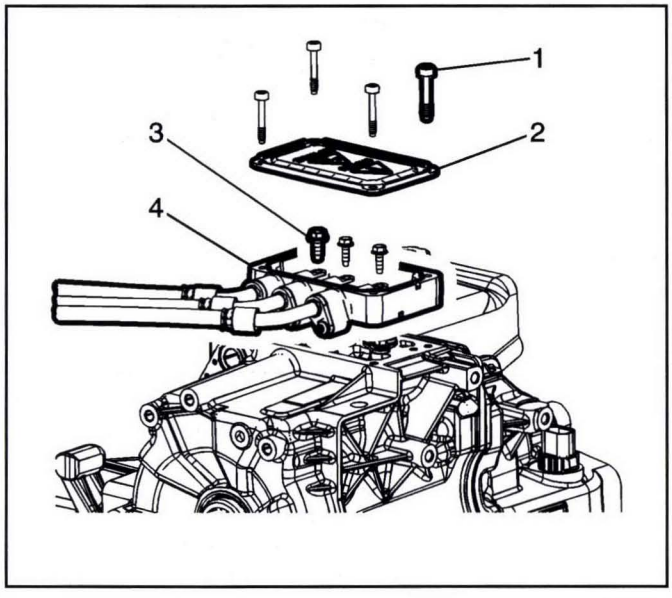
   Tighten

   - Bolt (1) to **9** N•m **(80 lb in)**
   - Bolt (2) to **9** N•m **(80 lb in)**
   - Bolt (3) to **9** N•m **(80 lb in)**



3212227

4. Install the ten fasteners in the sequence shown, and tighten to **9** N•m **(80 lb in)**.



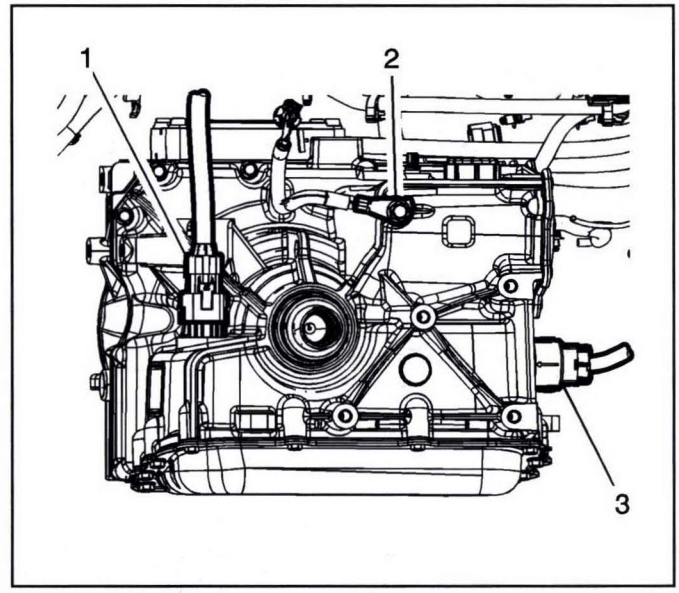
3351618

Note: A NEW seal must be installed every time the drive motor power inverter module connector has been disconnected.

5. Install the drive motor power inverter module connector assembly (4) onto the transmission with a NEW seal.
6. Install the 3 drive motor power inverter module connector bolts (3) and tighten to **9** N•m **(80 lb in)**.
7. Install the 3 phase cable assembly cover bolts (1) into the cable cover (2) with a NEW cover seal and tighten to **9** N•m **(80 lb in)**.
8. Raise the transmission and drive unit assembly into the vehicle.
9. Install the left side transmission mount. Refer to *Transmission Mount Replacement - Left Side on page 16-52*.
10. Install the right side transmission mount. Refer to *Transmission Mount Replacement - Right Side on page 16-53*.
11. Connect the range selector lever cable onto transmission. Refer to *Range Selector Lever Cable Replacement on page 16-36*.
12. Install the rear transmission mount bracket. Refer to *Transmission Rear Mount Bracket Replacement on page 16-50*.
13. Remove the support table.
14. Remove the jacks from each of the rear spring pads.

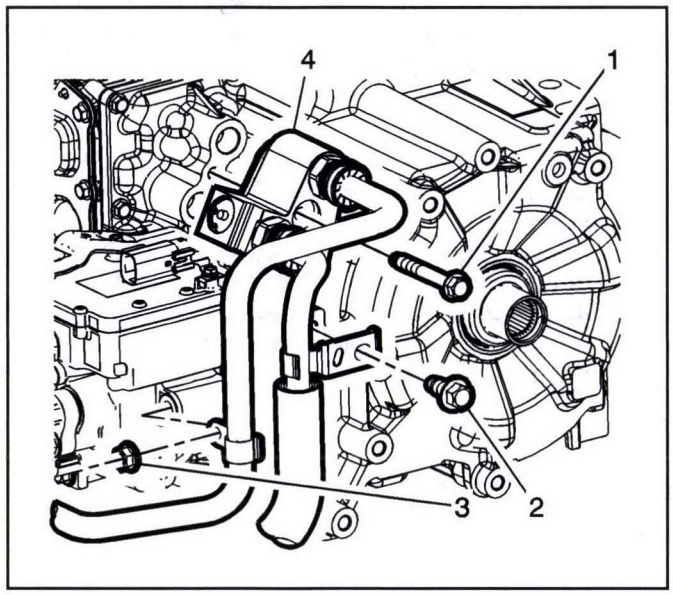
    Note: There is a internal resolver electrical connector (white 6 - wire) between the drive motor assembly and the transmission. This connector is accessed inside the transmission above the fluid pump.

15. Reaching inside the transmission, connect the resolver electrical connector.
16. Install the fluid pump in the transmission. Refer to *Transmission Fluid Pump Replacement on page 16-39*.



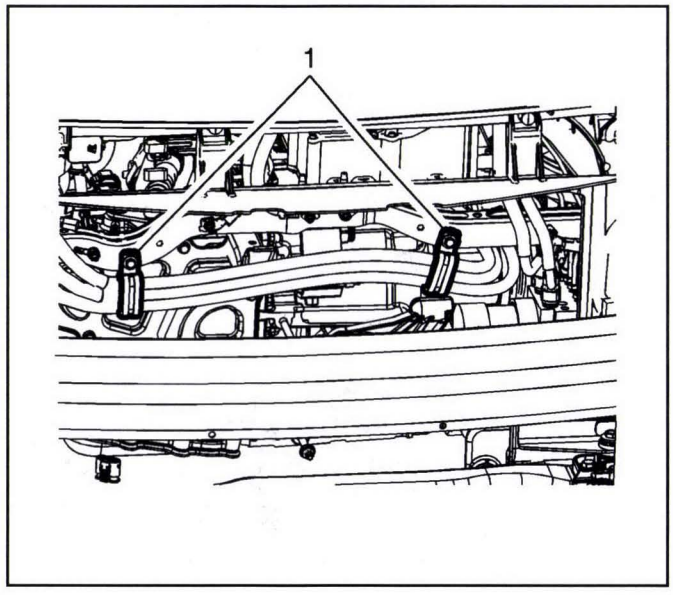
3351605

17. Connect the transmission fluid pump connector (1) to the rear of the transmission.
18. Install the ground cable bolt (2) and tighten to **40** N•m **(30 lb ft)**.
19. Connect the transmission fluid pump connector (3) to the rear of the transmission.



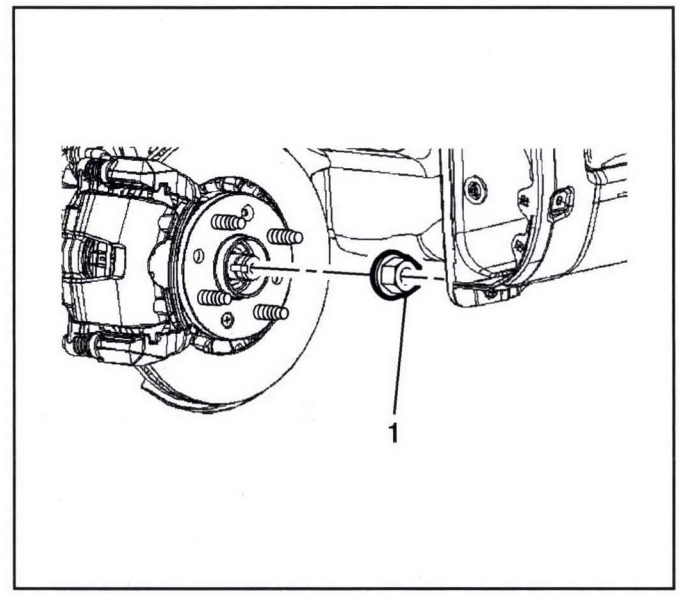
3351604

20. Install the transmission fluid cooler bypass valve bolt (1) and tighten to **22** N•m **(16 lb ft)**.
21. Install the cooler inlet pipe mounting bolt (2) and tighten to **30** N•m **(22 lb ft)**.
22. Install the cooler outlet pipe mounting bolt (3) and tighten to **23** N•m **(17 lb ft)**.



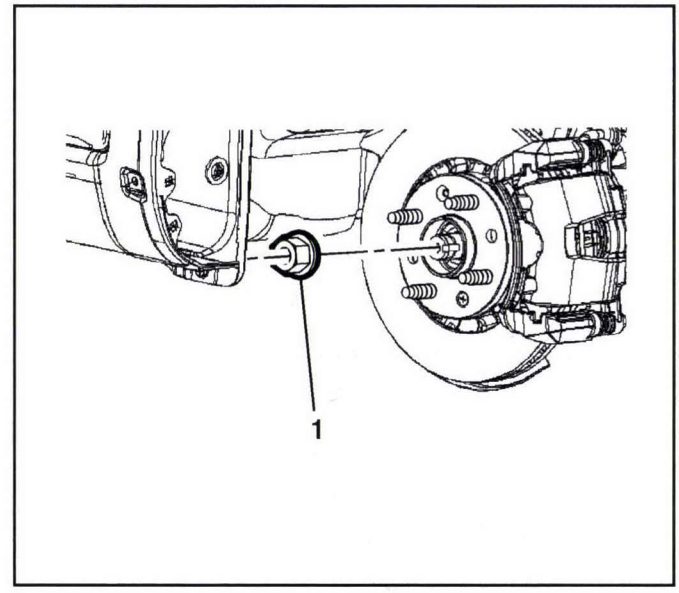
3121919

23. Install the high voltage cable retainer fasteners, then tighten the retaining bolts (1) to **9** N•m **(80 lb in)**.
24. Install air conditioning compressor to the drive unit. Refer to *Air Conditioning Compressor Replacement on page 10-26*.



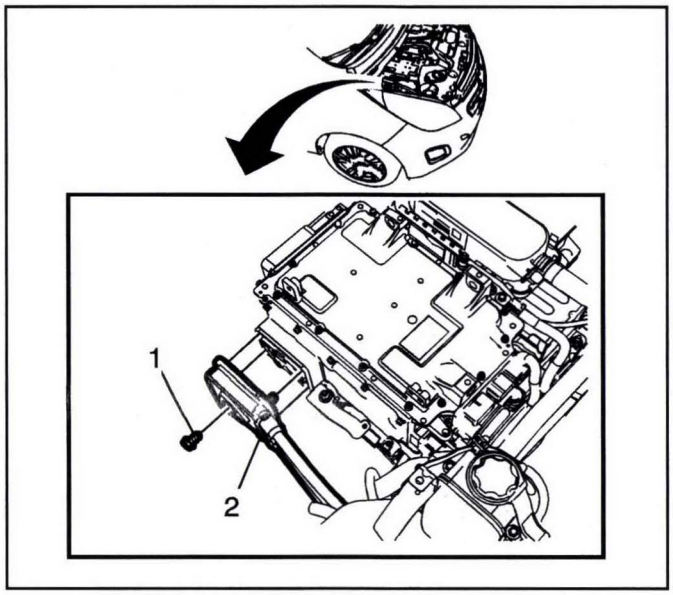
3327119

25. Install the left front wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement - Left Side on page 7-4*.



3327121

26. Install the right front wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement - Right Side on page 7-7*.



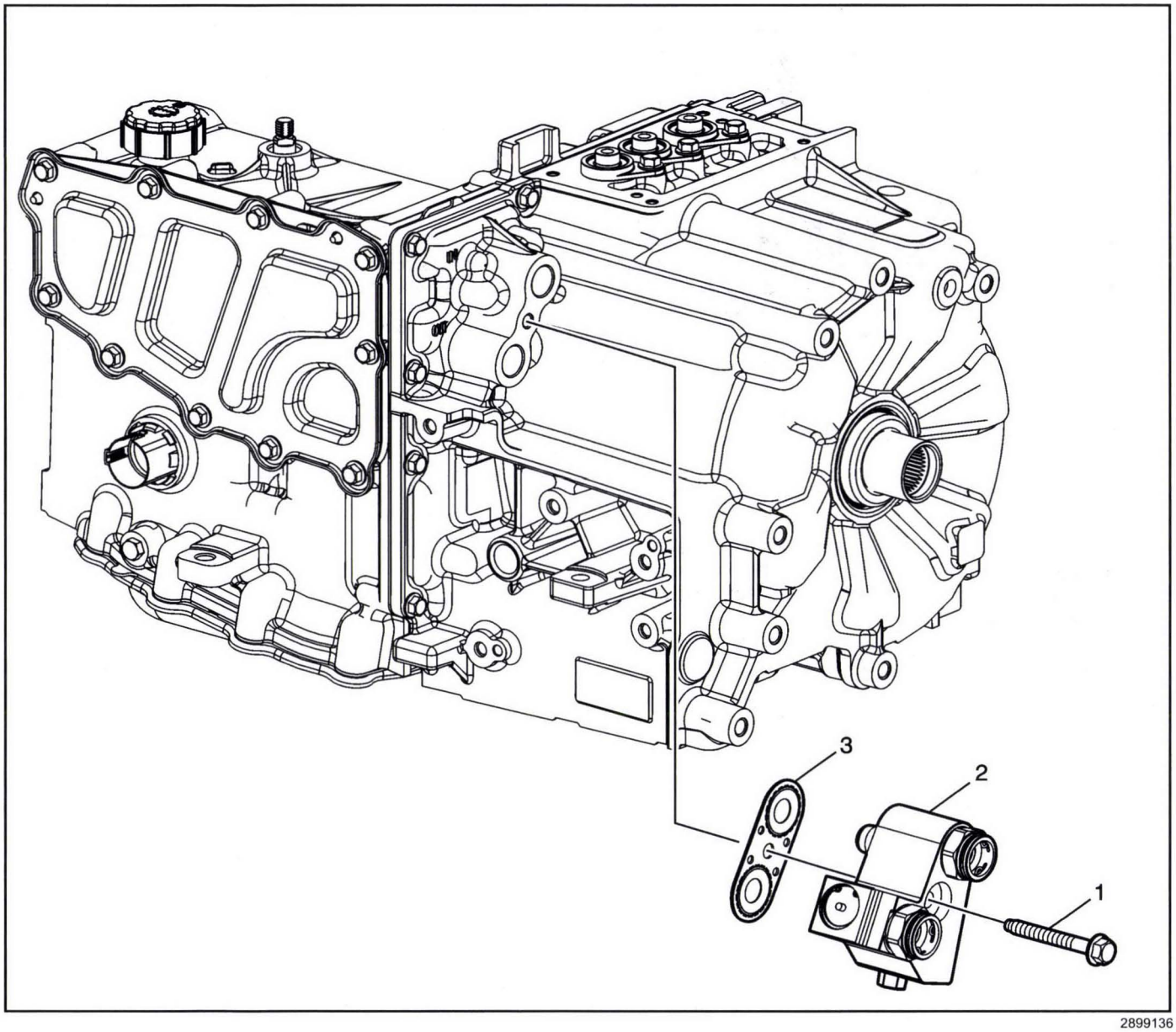
3232258

Note: A NEW seal must be installed every time the 3 phase high voltage cable connector has been disconnected.

27. Install a NEW 3 phase connector seal to the connector (2).
28. Install the 3 phase high voltage cable connector onto the drive motor generator power inverter module, then tighten the cable connector bolts (1) to **9** N•m **(80 lb in)**.
29. Enable the high voltage systems. Refer to *High Voltage Enabling on page 9-367*.
30. Fill the transmission with transmission fluid. Refer to *Transmission Fluid Drain and Fill on page 16-42*.
31. Verify proper operation of the transmission.

Repair Instructions - Off Vehicle

Transmission Fluid Cooler Bypass Valve Removal

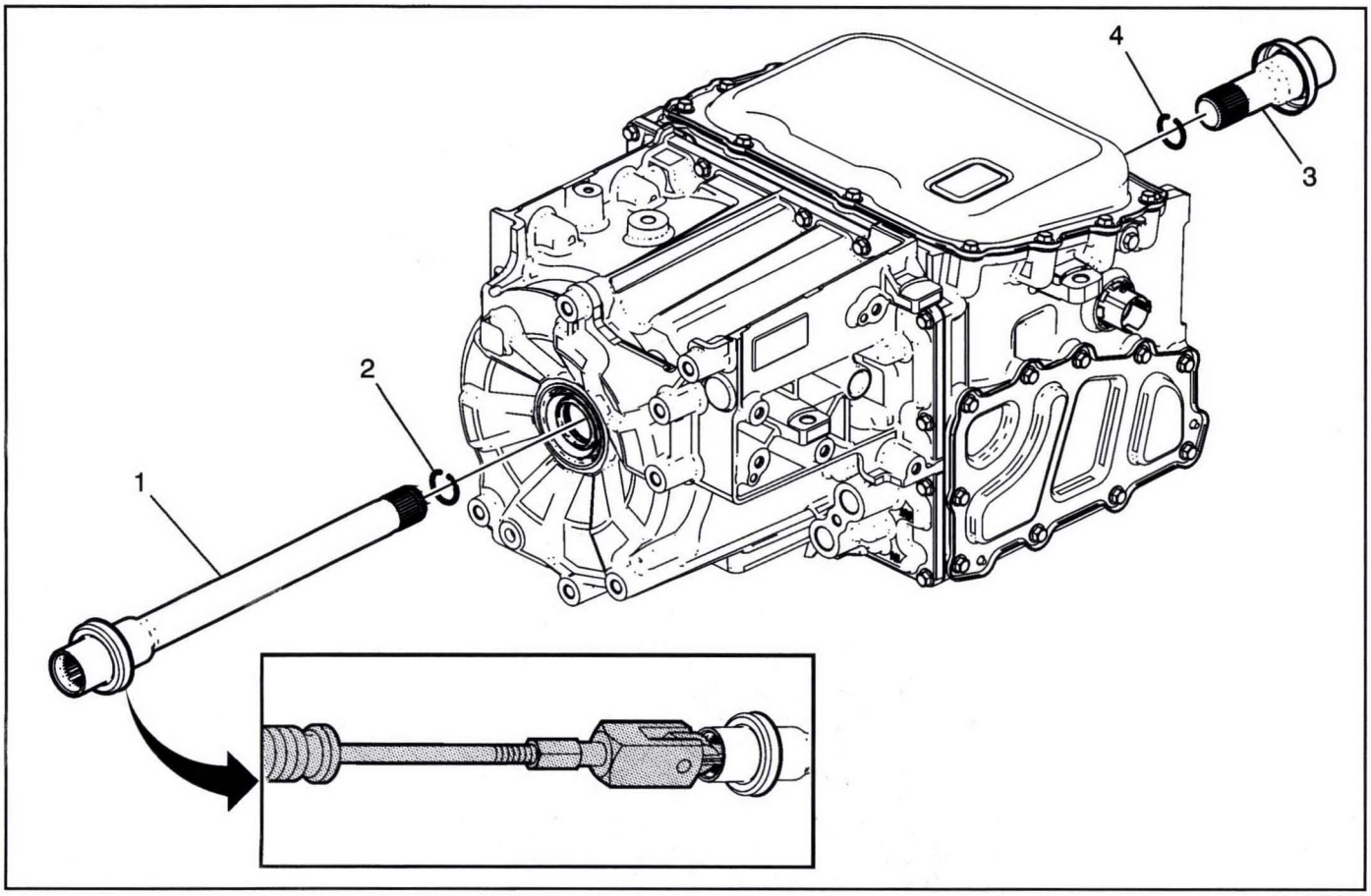


2899136

Transmission Fluid Cooler Bypass Valve Removal

Callout	Component Name
1	Transmission Fluid Cooler Thermal Bypass Valve Bolt M8 x 1.25 x 65.8 (Qty : 1)
2	Transmission Fluid Cooler Bypass Valve
3	Transmission Fluid Cooler Thermal Bypass Valve Gasket **Note:** Discard gasket, it is not reusable.

Output Shaft Removal

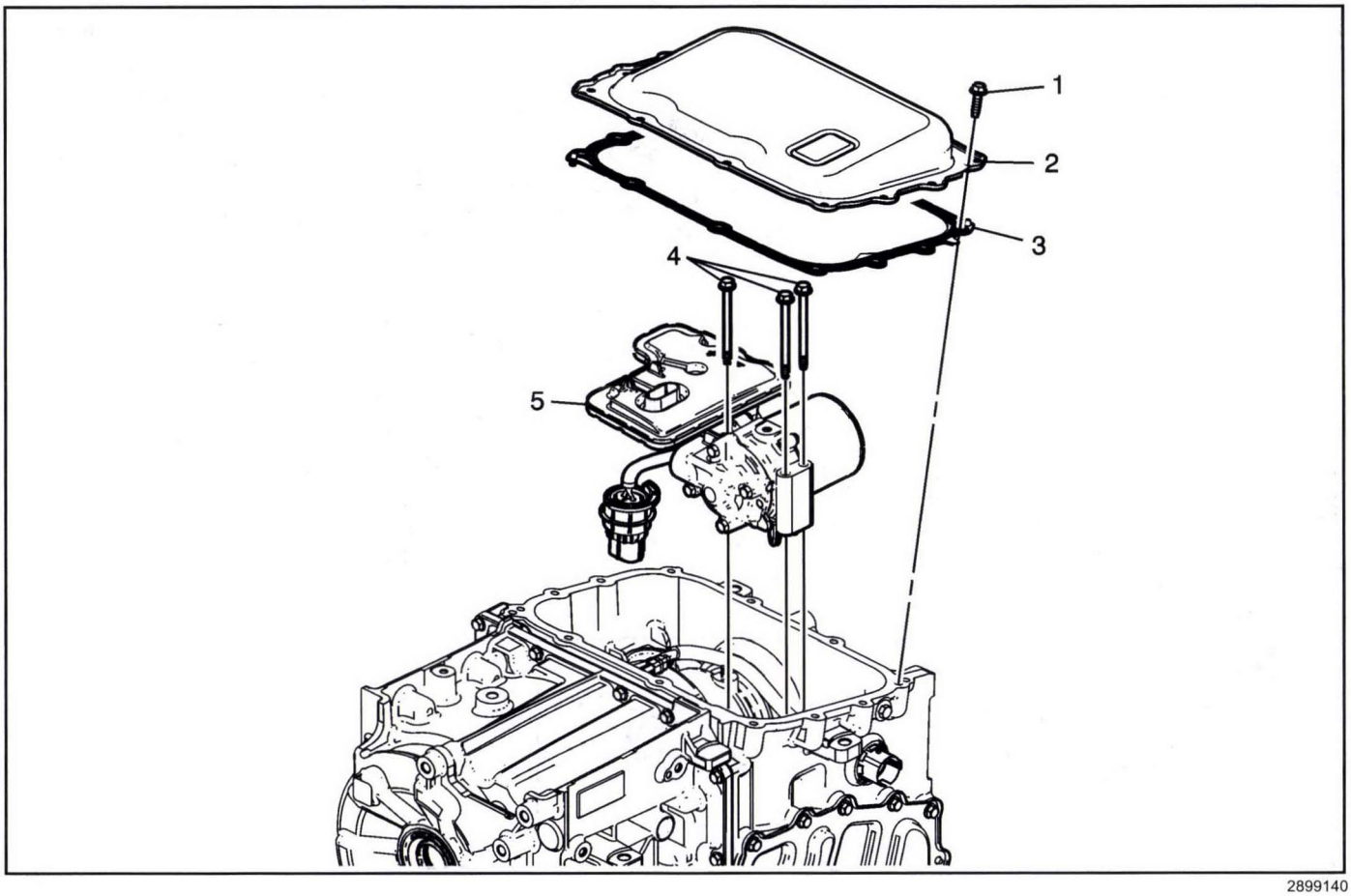


2899138

Output Shaft Removal

Callout	Component Name
1	Output Shaft Assembly (LHS) **Note:** The output shaft assembly is retained by an internal retaining ring. **Special Tools** • *GE-6125-1B* Slide Hammer with Adapter • *J-23907* Bearing Adapter For equivalent regional tools, refer to *Special Tools on page 16-96*.
2	Output Shaft Retaining Ring **Note:** Discard the output shaft retaining ring.
3	Output Shaft Assembly (RHS) **Note:** The output shaft assembly is retained by an internal retaining ring. **Special Tools** • *GE-6125-1B* Slide Hammer with Adapter • *J-23907* Bearing Adapter For equivalent regional tools, refer to *Special Tools on page 16-96*.
4	Output Shaft Retaining Ring **Note:** Discard the output shaft retaining ring.

Transmission Fluid Pan and Fluid Pump Removal

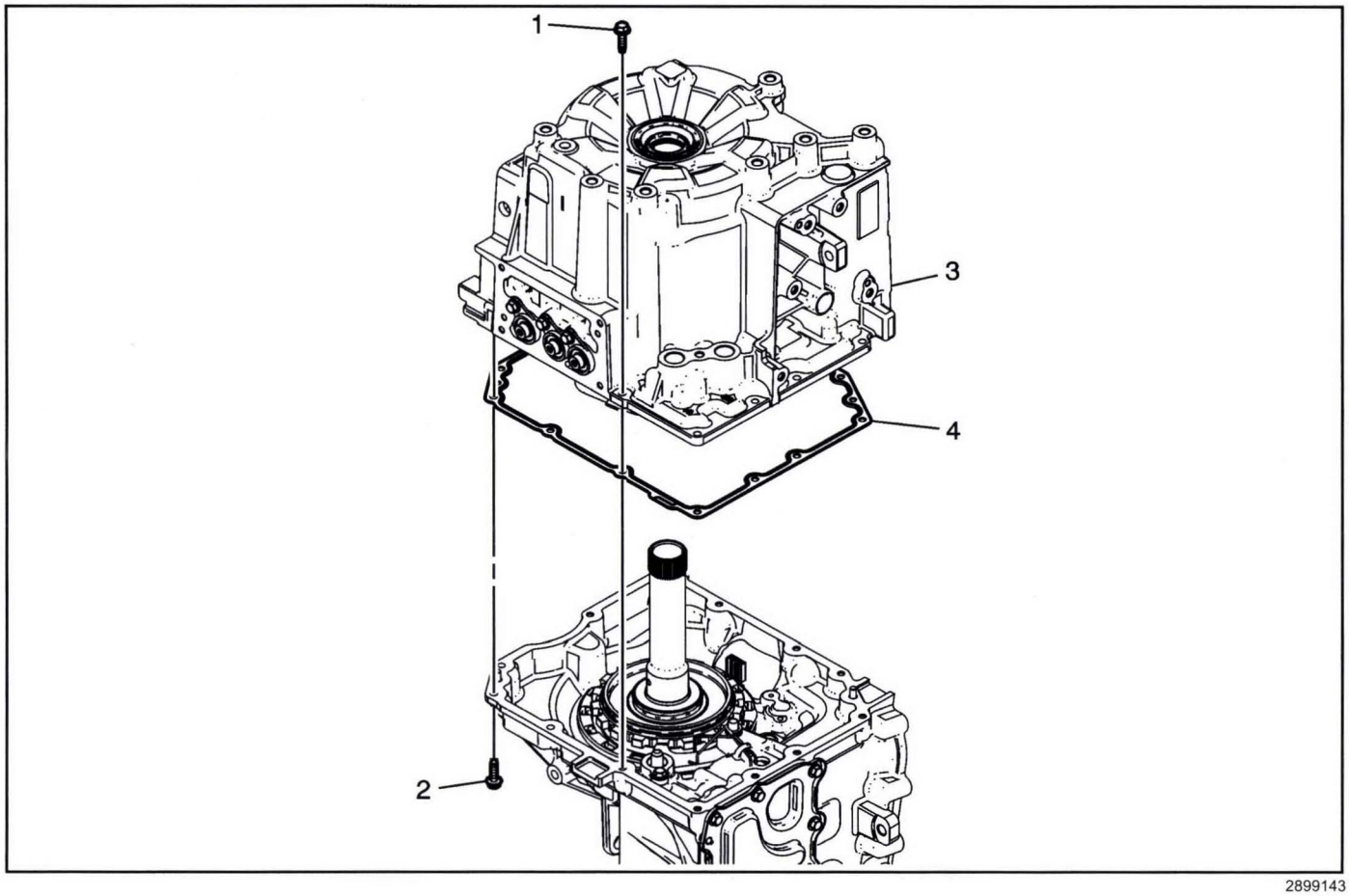


2899140

Transmission Fluid Pan and Fluid Pump Removal

Callout	Component Name
1	A/Trans Fluid Pan Bolt M6 x 1.0 x 25 (Qty: 12)
2	A/Trans Fluid Pan
3	A/Trans Fluid Pan Gasket **Note:** Discard gasket, it is not reusable.
4	A/Trans Fluid Pump Bolt M6 x 1.0 x 85.65 (Qty: 3)
5	A/Trans Fluid Pump Assembly **Procedure** Press the locking tabs inward to remove the A/Trans fluid pump motor cable from the case.

Drive Motor Housing Removal

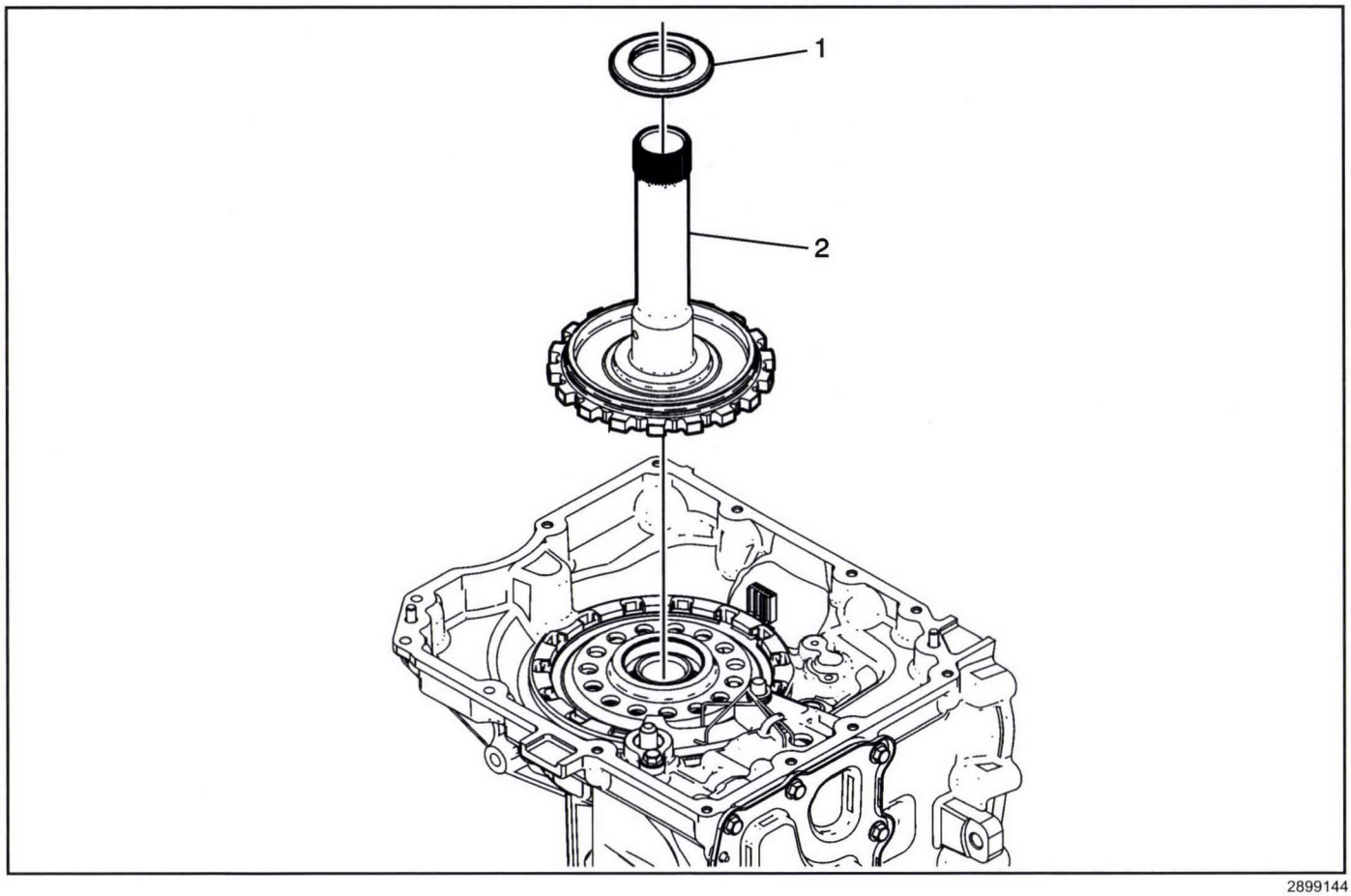


2899143

Drive Motor Housing Removal

Callout	Component Name
1	A/Trans Case Bolt M6 x 1.0 x 25 (Qty: 10)
2	A/Trans Case Bolt M6 x 1.0 x 25 (Qty: 3)
3	Drive Motor Housing Assembly
4	A/Trans Case Gasket **Note:** Discard gasket, it is not reusable.

Main Shaft Removal

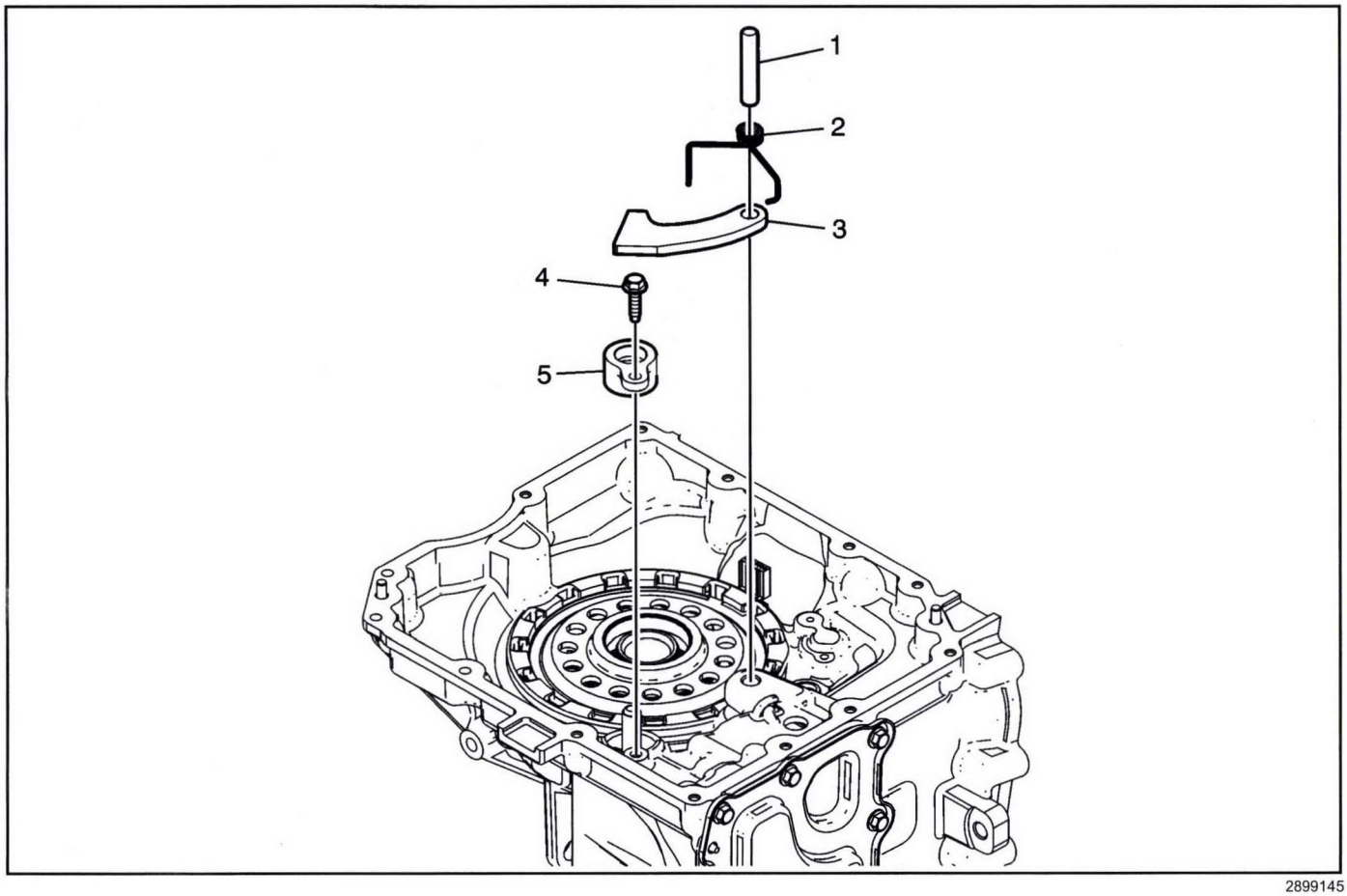


2899144

Main Shaft Removal

Callout	Component Name
1	Front Differential Carrier Bearing (LHS)
2	Main Shaft

Park Pawl Removal

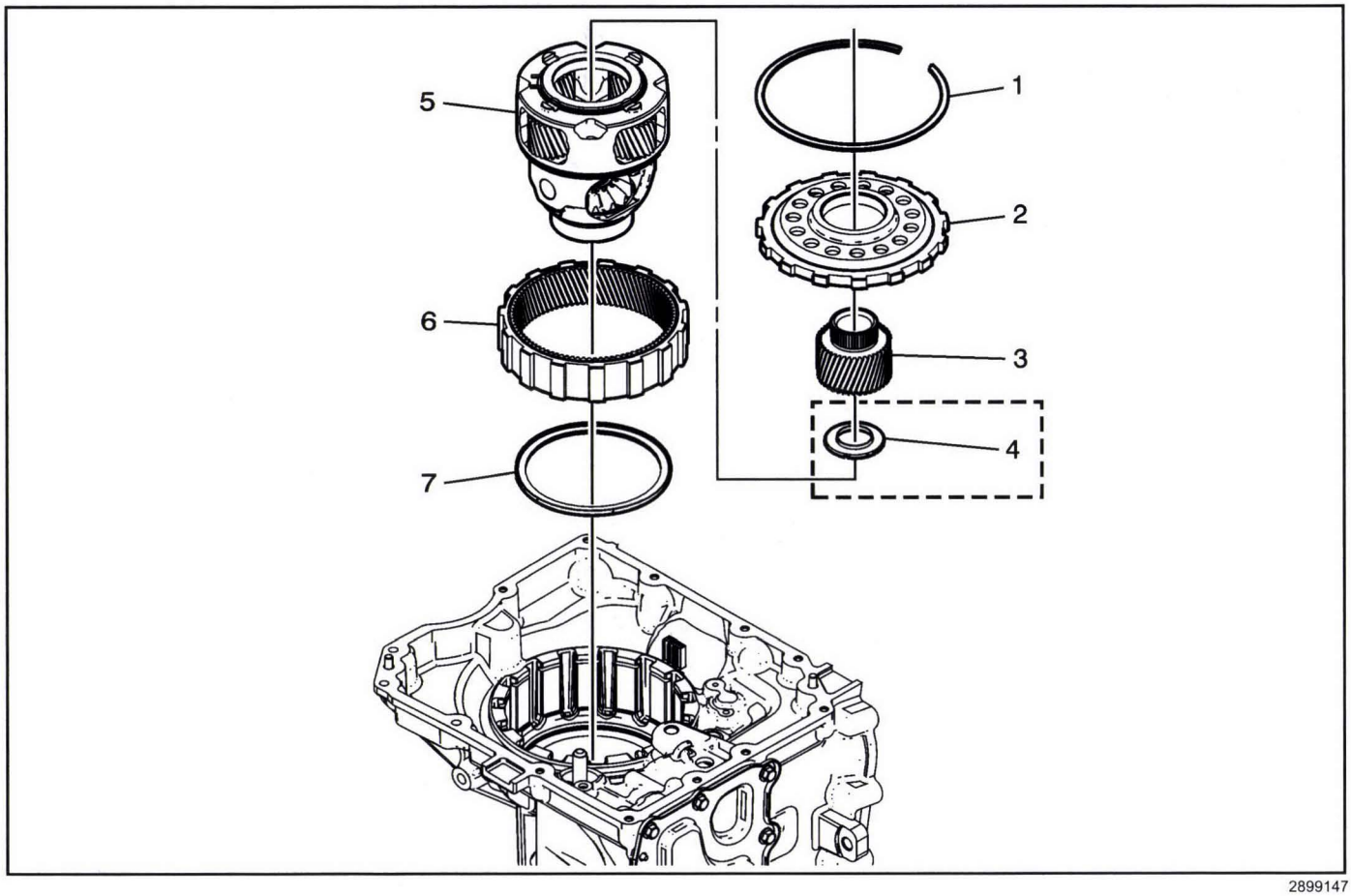


2899145

Park Pawl Removal

Callout	Component Name
1	Park Pawl Shaft
2	Park Pawl Spring
3	Park Pawl
4	Park Pawl Actuator Guide Bolt M6 x 1.0 x 25 (Qty: 1)
5	Park Pawl Actuator Guide

Front Differential Carrier Removal

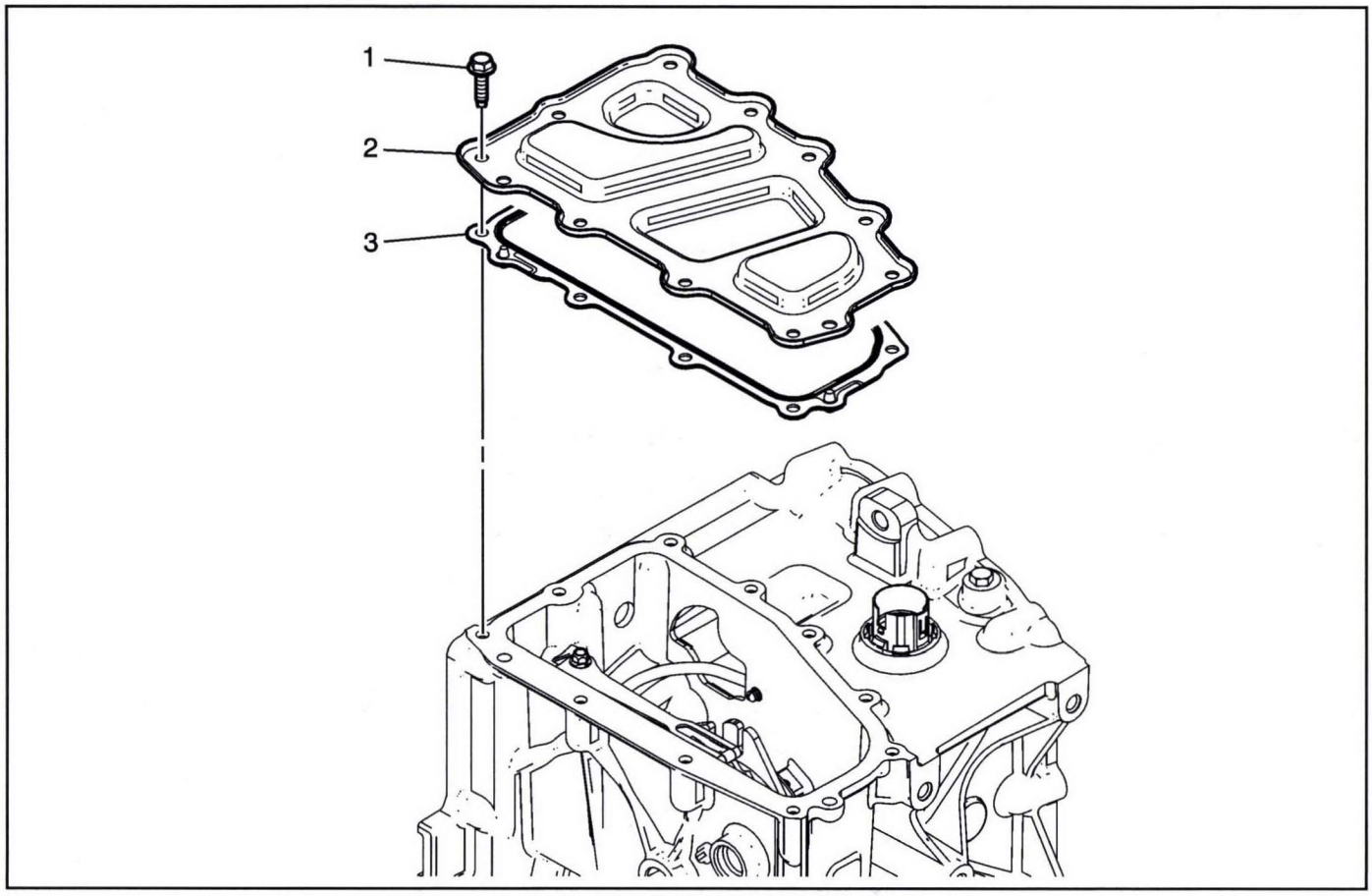


2899147

Front Differential Carrier Removal

Callout	Component Name
1	Front Differential Ring Gear Retainer
2	Park Gear Hub Assembly
3	Front Differential Carrier Sun Gear
4	Front Differential Carrier Sun Gear Thrust Bearing (Model Dependent)
5	Front Differential Carrier Assembly
6	Front Differential Ring Gear
7	Front Differential Carrier Bearing (RHS)

Shift Shaft Cover Removal

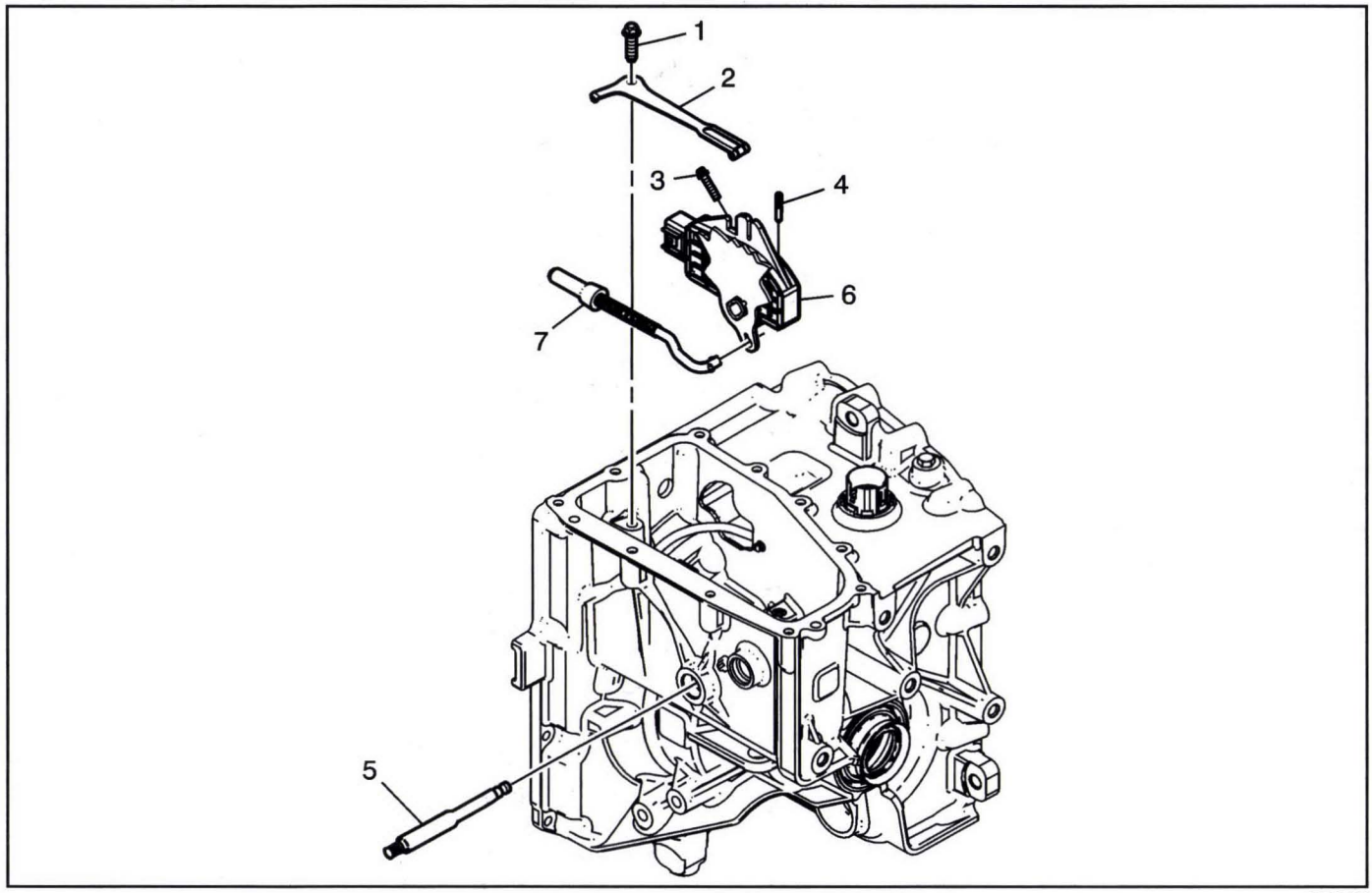


2899149

Shift Shaft Cover Removal

Callout	Component Name
1	Shift Shaft Detent Spring Cover Bolt M6 x 1.0 x 25 (Qty: 10)
2	Shift Shaft Cover
3	Shift Control Shaft Cover Gasket

Manual Shift Shaft Position Switch Removal

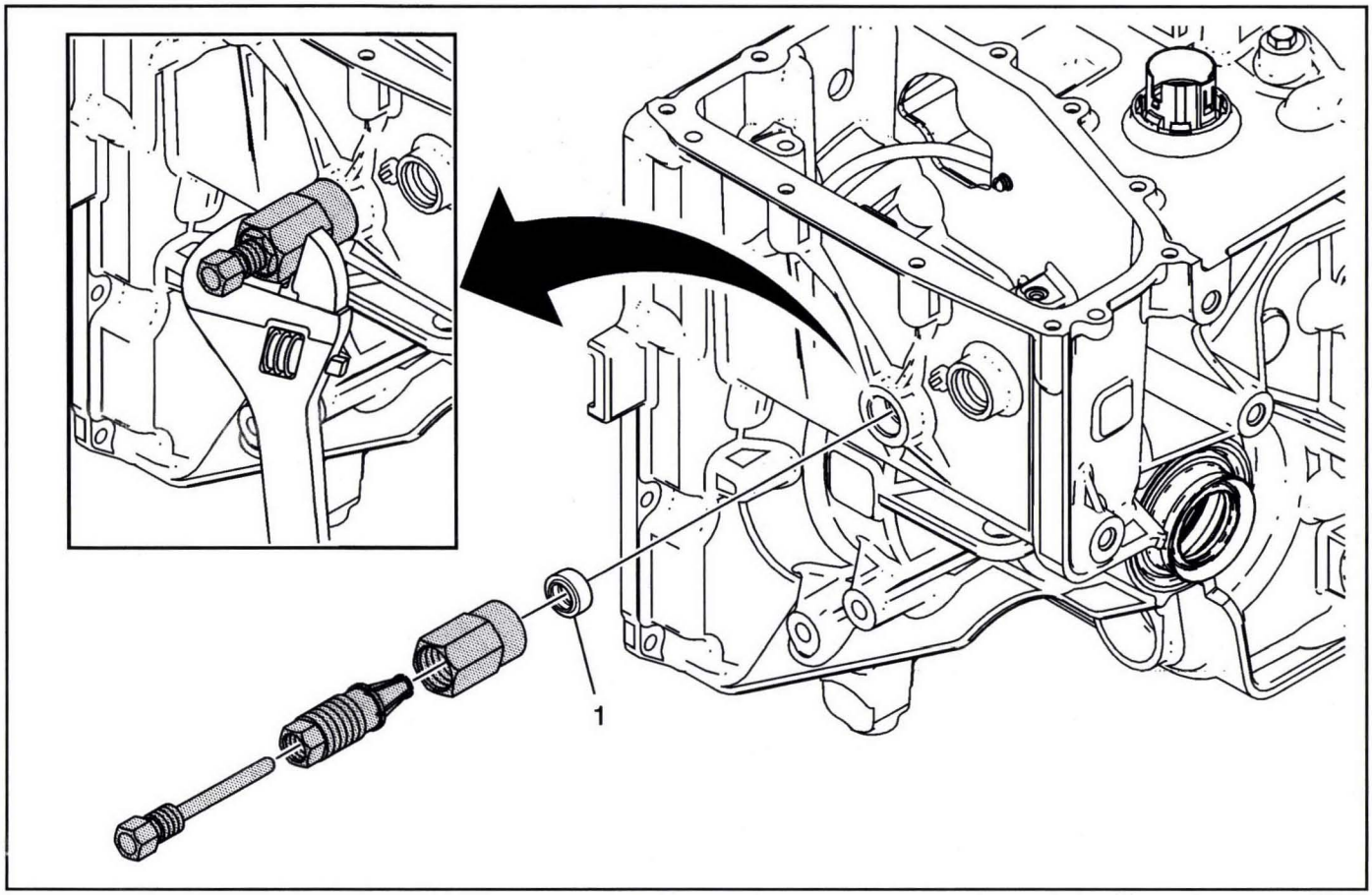


2899151

Manual Shift Shaft Position Switch Removal

Callout	Component Name
1	Manual Shift Detent Spring Bolt M6 x 1.0 x 25.65 (Qty: 1)
2	Manual Shift Detent Assembly
3	A/Trans Manual Shift Shaft Position Switch Bolt M5 x 0.8 x 20 (Qty: 1)
4	Manual Shift Shaft Pin **Note:** The pin is a press fit.
5	Manual Shift Shaft **Note:** The manual shift shaft seal must be replaced if replacing the manual shift shaft. Refer to *Manual Shift Shaft Seal Removal on page 16-69* or *Manual Shift Shaft Position Switch Installation on page 16-82*.
6	A/Trans Manual Shift Shaft Position Switch Assembly
7	Park Pawl Actuator Assembly

Manual Shift Shaft Seal Removal

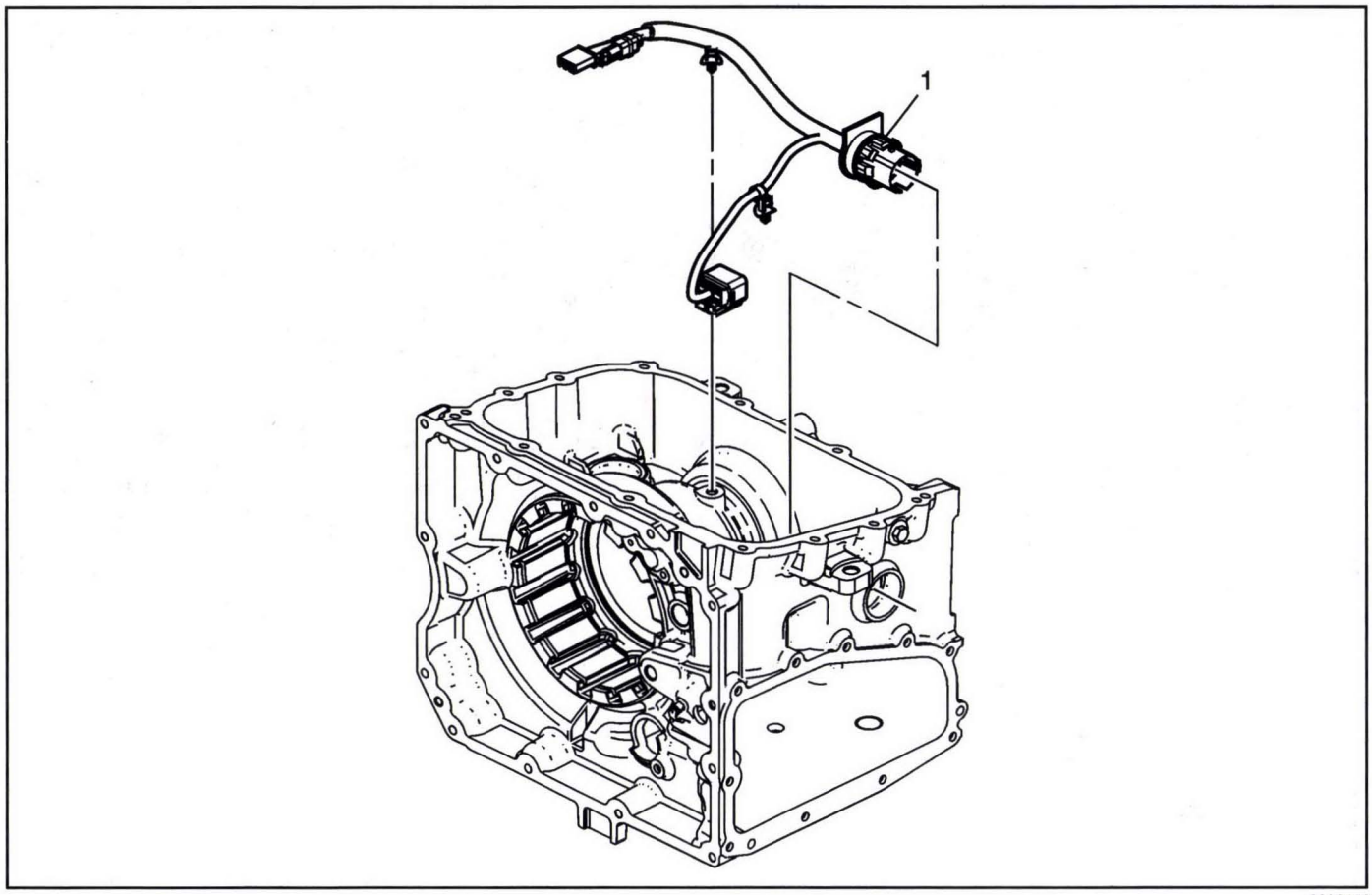


3331747

Manual Shift Shaft Seal Removal

Callout	Component Name
1	Manual Shift Shaft Seal **Note:** Discard seal, it is not reusable. **Special Tool** *DT 45201* Cooler Line Seal Remover For equivalent regional tools, refer to *Special Tools on page 16-96*.

Transmission Control Wiring Harness Removal

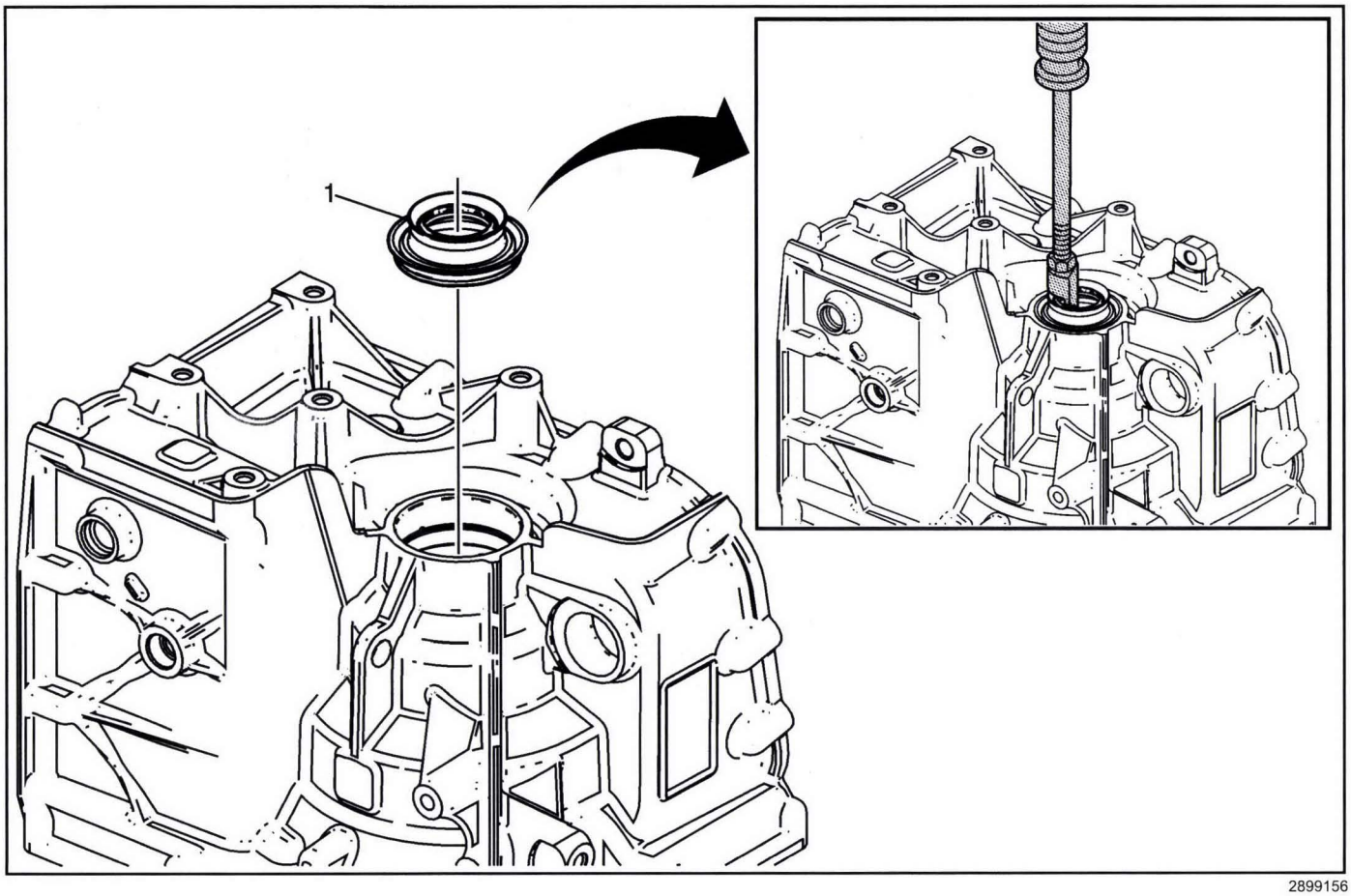


2899153

Transmission Control Wiring Harness Removal

Callout	Component Name
1	A/Trans Control Wiring Harness Assembly

Front Wheel Drive Shaft Oil Seal Removal - Right Side

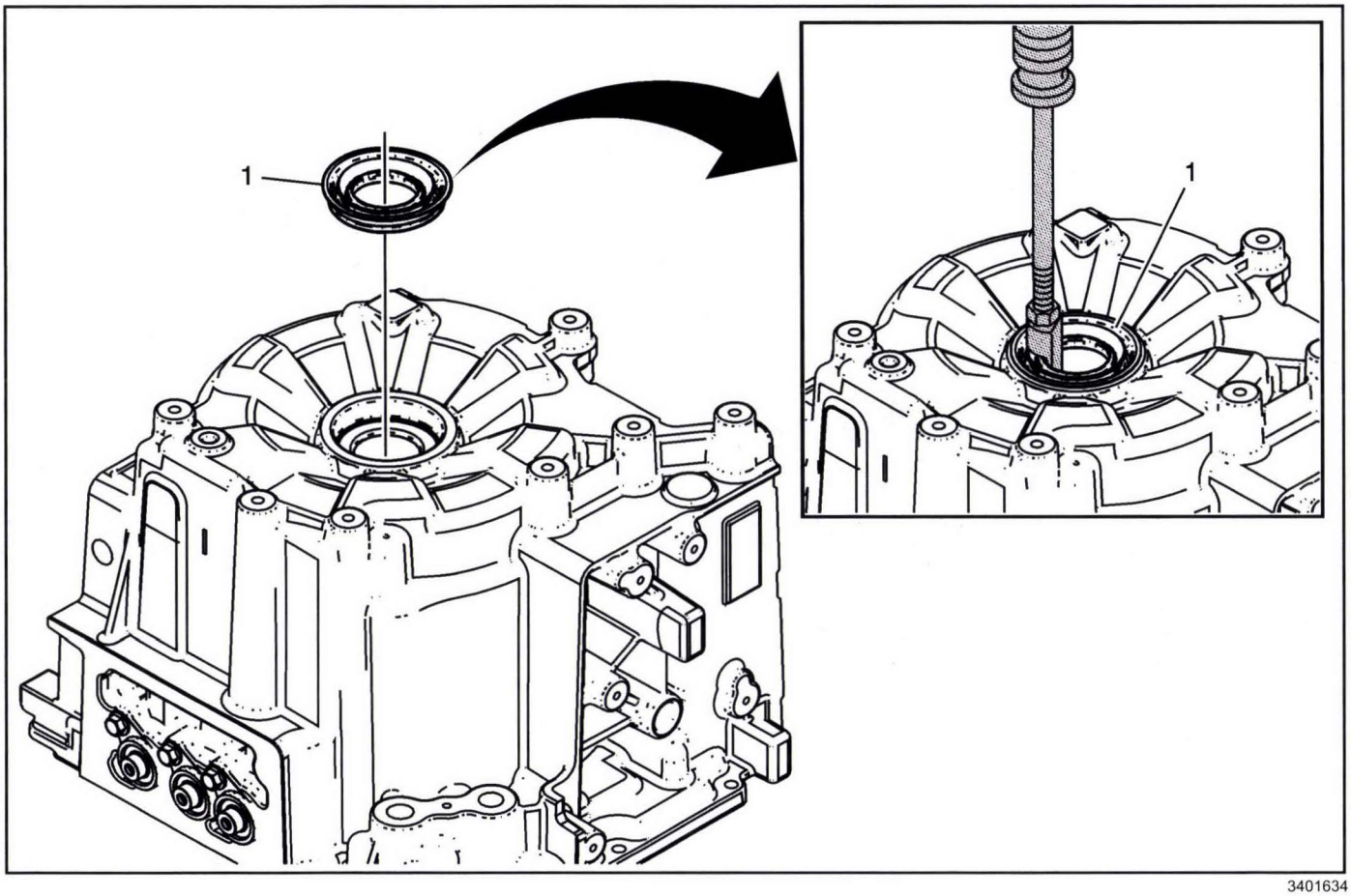


2899156

Front Wheel Drive Shaft Oil Seal Removal - Right Side

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal Assembly (RHS) **Special Tools** • *DT-23129* Universal Seal Remover • *GE-6125-1B* Slide Hammer with Adapter For equivalent regional tools, refer to *Special Tools on page 16-96*.

Front Wheel Drive Shaft Oil Seal Removal - Left Side

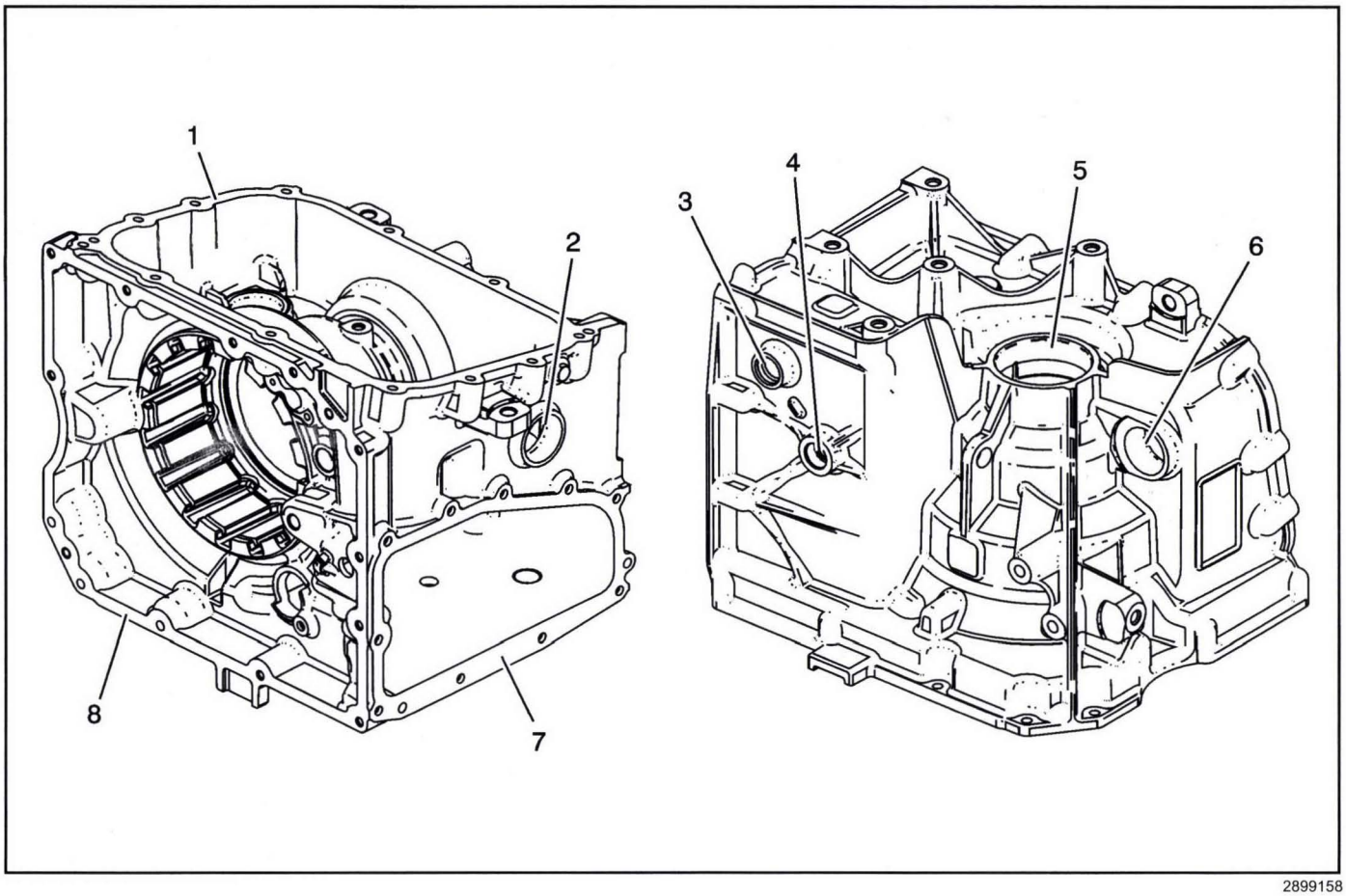


3401634

Front Wheel Drive Shaft Oil Seal Removal - Left Side

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal Assembly (LHS) **Special Tools** • *DT-23129* Universal Seal Remover • *GE-6125-1B* Slide Hammer with Adapter For equivalent regional tools, refer to *Special Tools on page 16-96*.

Transmission Case Cleaning and Inspection

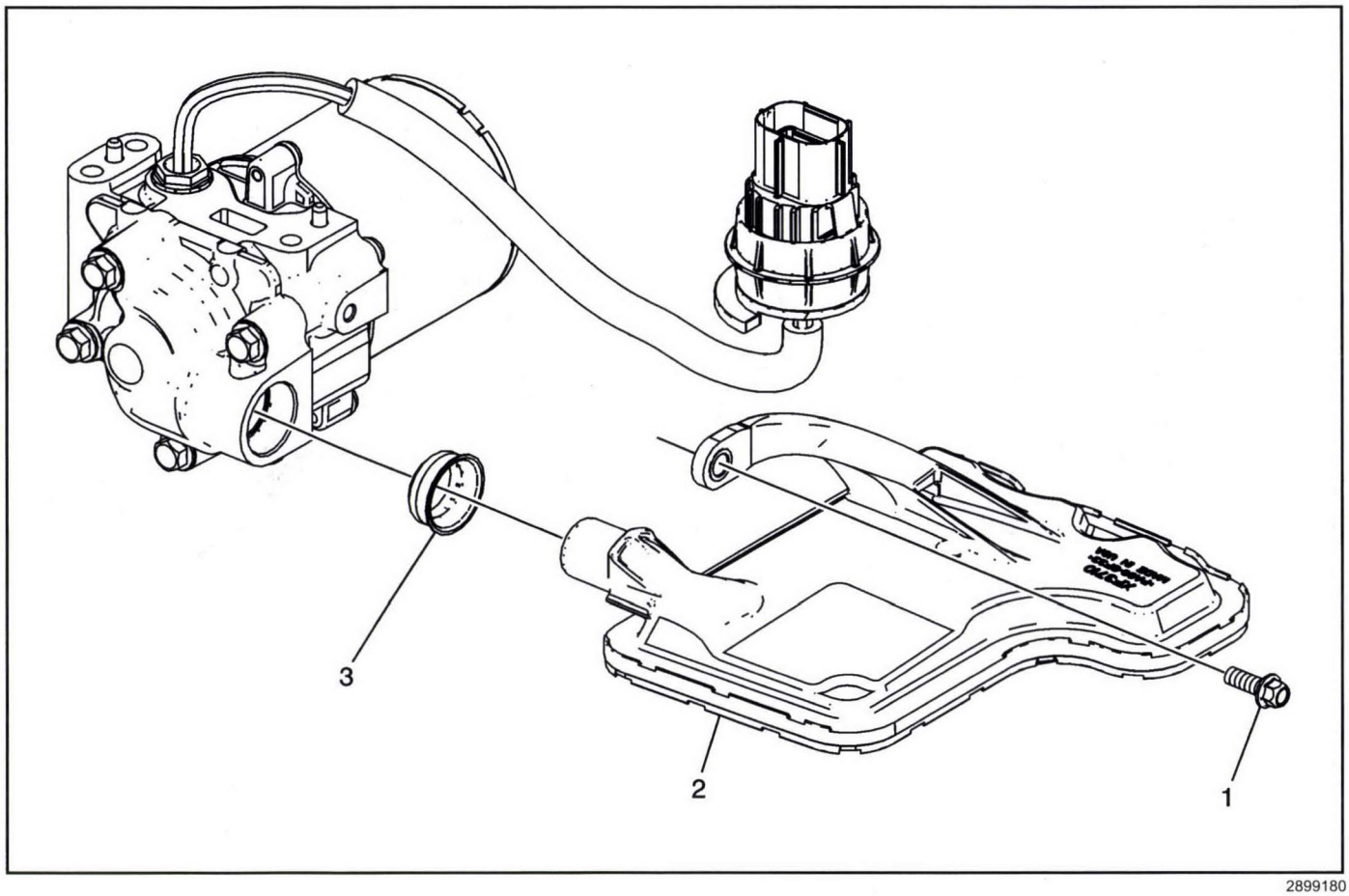


2899158

Transmission Case Cleaning and Inspection

Callout	Component Name
Caution: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure. **Caution:** Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component. **Preliminary Procedures** 1. Thoroughly clean the transmission case assembly, including case threads, with clean solvent. 2. Clean gasket sealing surfaces. Remove all residual gasket material. 3. Inspect all threaded holes. If necessary, repair any thread damage.	
1	A/Trans Fluid Pan Gasket Sealing Surface
2	A/Trans Control Wiring Harness Assembly Passage Sleeve Bore
3	A/Trans Fluid Fill Cap Hole Threads
4	Manual Shift Shaft Seal Bore
5	Front Wheel Drive Shaft Oil Seal Bore
6	A/Trans Fluid Pump Motor Cable Passage Sleeve Bore
7	Shift Shaft Cover Gasket Sealing Surface
8	Drive Motor Housing Assembly Gasket Sealing Surface

Transmission Fluid Pump Disassemble
Transmission Fluid Filter Removal

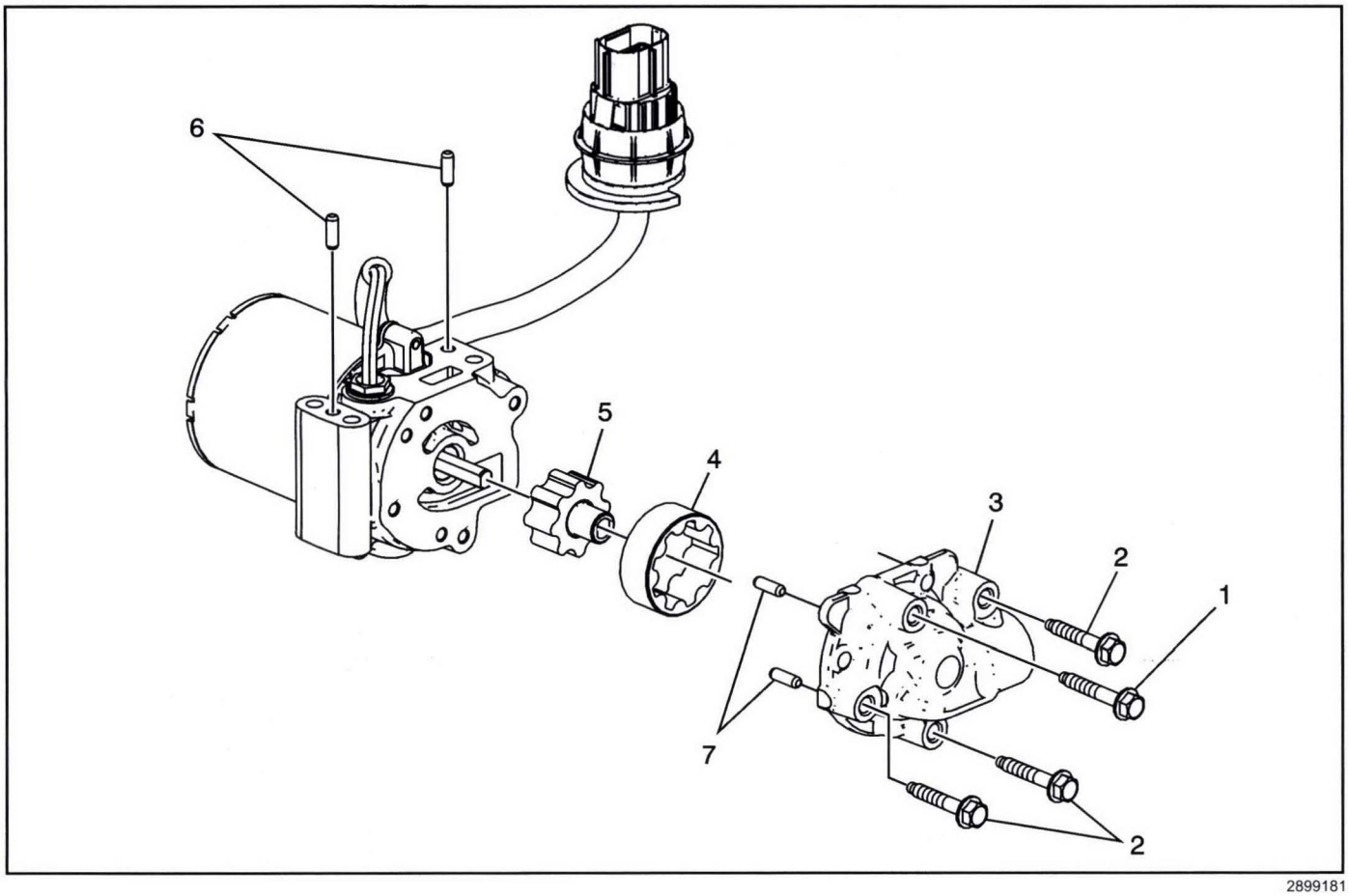


2899180

Transmission Fluid Filter Removal

Callout	Component Name
1	A/Trans Fluid Filter Bolt M6 x 1.0 x 20 (Qty: 1)
2	A/Trans Fluid Filter Assembly
3	A/Trans Fluid Filter Seal **Note:** The A/Trans fluid filter seal is reusable. Inspect the seal to determine if it may be reused. If the seal is damaged or worn, it should be replaced

Transmission Fluid Pump Body and Gears Removal

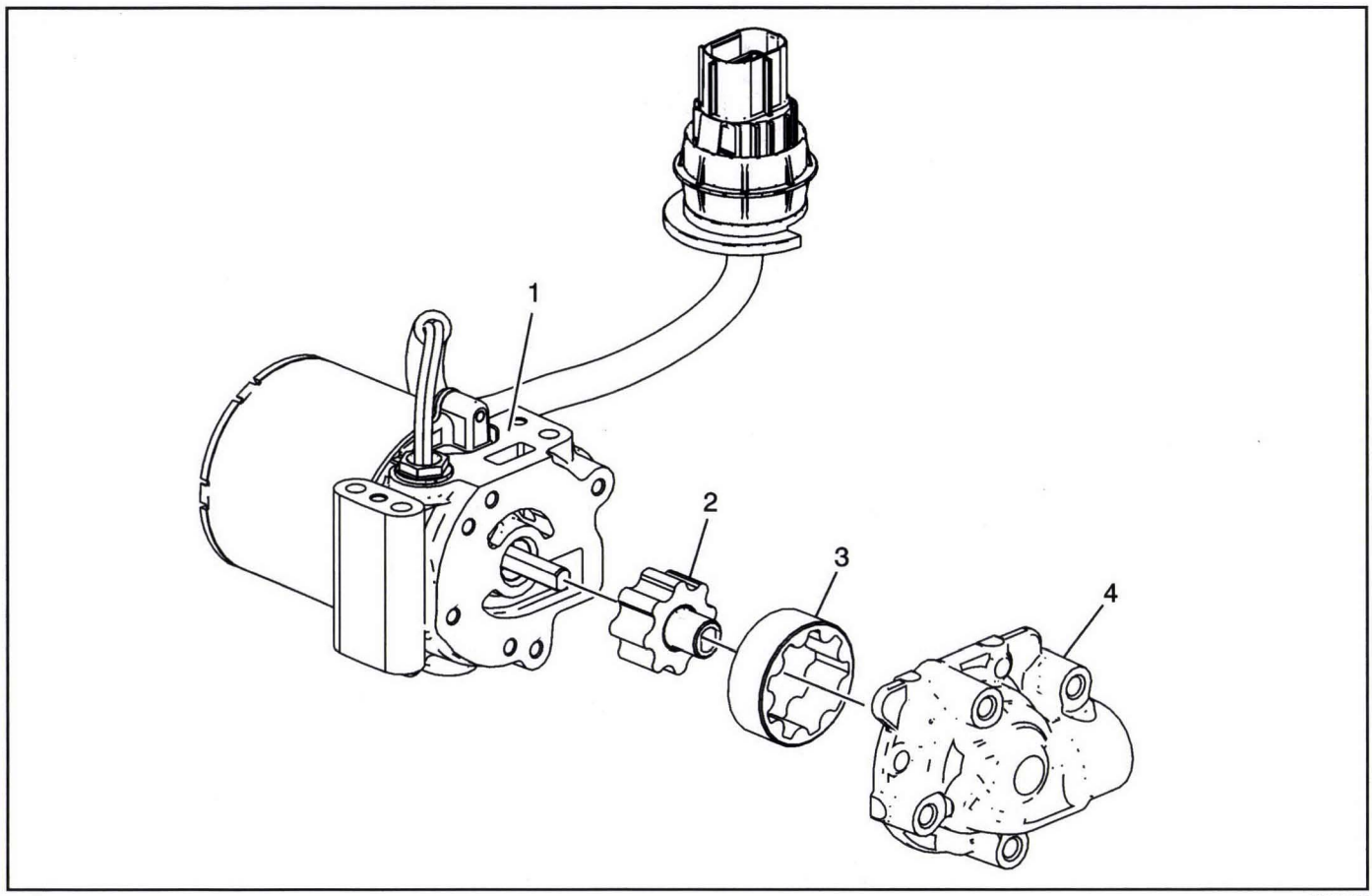


2899181

Transmission Fluid Pump Body and Gears Removal

Callout	Component Name
1	A/Trans Fluid Pump Bolt M6 x 1.0 x 45 (Qty: 1)
2	A/Trans Fluid Pump Bolt M6 x 1.0 x 35 (Qty: 3)
3	A/Trans Fluid Pump Body
4	A/Trans Fluid Pump Driven Gear
5	A/Trans Fluid Pump Drive Gear
6	A/Trans Fluid Pump Locating Pins (Qty: 2) **Note:** Remove the locating pins as necessary.
7	A/Trans Fluid Pump Locating Pins (Qty: 2) **Note:** Remove the locating pins as necessary.

Transmission Fluid Pump Cleaning and Inspection

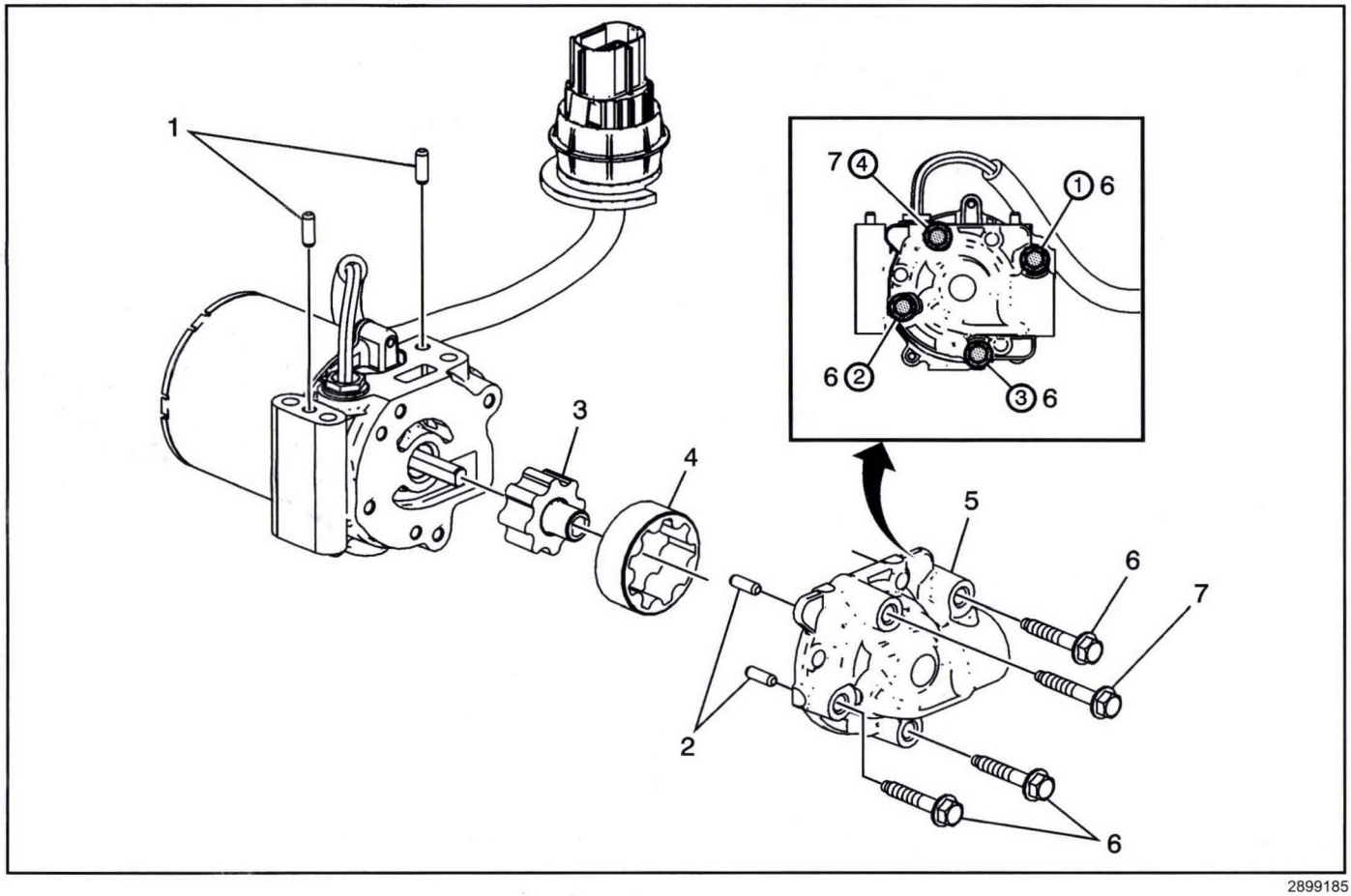


2899183

Transmission Fluid Pump Cleaning and Inspection

Callout	Component Name
Caution: Do not use abrasive pads or bristle devices to clean the sealing surfaces. Abrasive pads produce a fine grit that can effect transmission function. Abrasive pads can also remove enough metal to create oil leaks. **Caution:** After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure. **Caution:** Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component. **Preliminary Procedure** 1. Thoroughly clean the transmission fluid pump body and gears with clean solvent. 2. Clean sealing surfaces. 3. Inspect all threaded holes. If necessary, repair any thread damage.	
1	A/Trans Fluid Pump-to-Case Sealing Surface
2	A/Trans Fluid Pump Drive Gear
3	A/Trans Fluid Pump Driven Gear
4	A/Trans Fluid Pump Body

Transmission Fluid Pump Assemble
Transmission Fluid Pump Body and Gears Installation

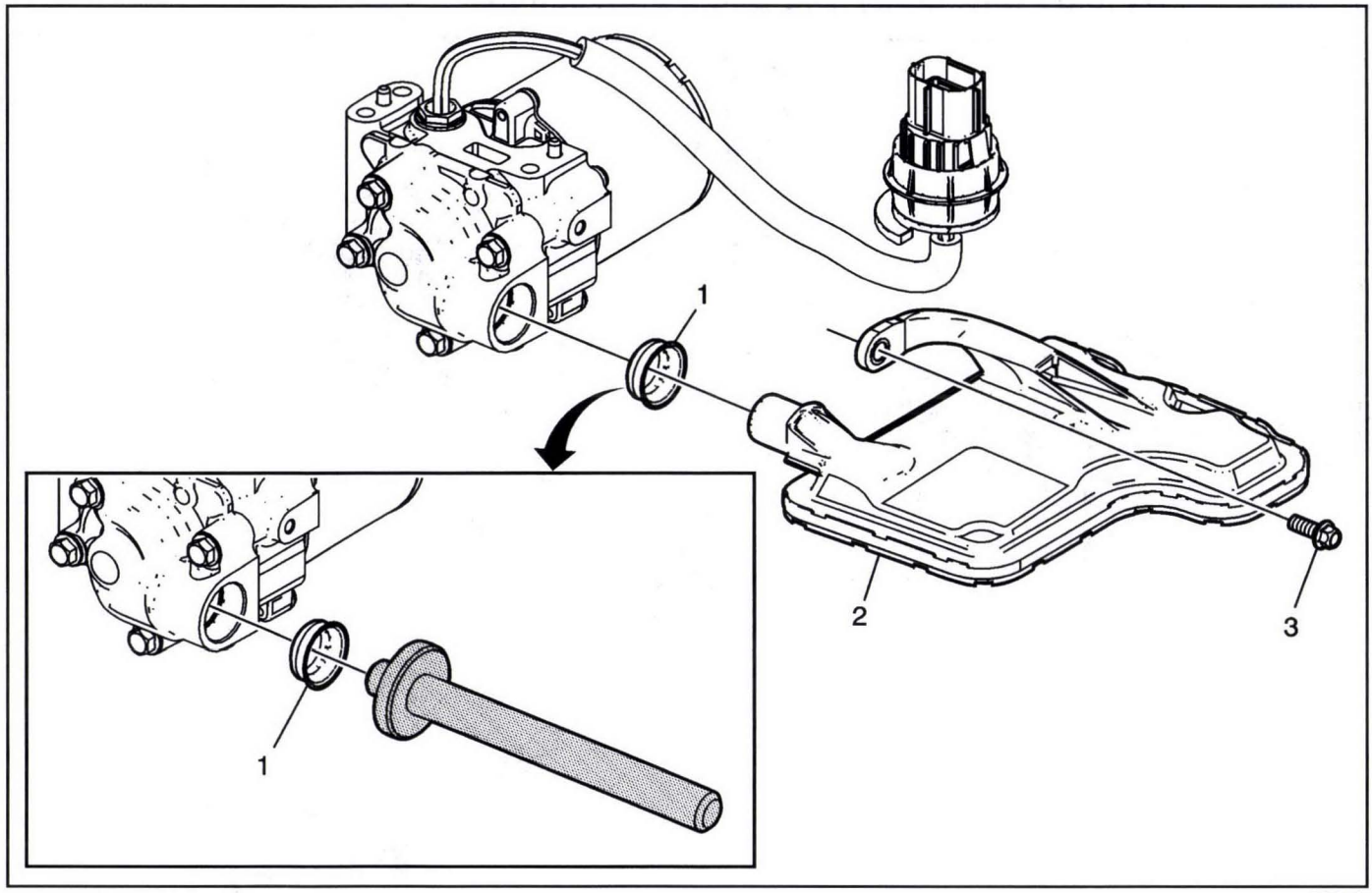


2899185

Transmission Fluid Pump Body and Gears Installation

Callout	Component Name
1	A/Trans Fluid Pump Locating Pins (Qty: 2) **Note:** Install the locating pins as necessary.
2	A/Trans Fluid Pump Locating Pins (Qty: 2) **Note:** Install the locating pins as necessary.
3	A/Trans Fluid Pump Drive Gear
4	A/Trans Fluid Pump Driven Gear
5	A/Trans Fluid Pump Body
6	A/Trans Fluid Pump Bolt M6 x 1.0 x 35 (Qty: 3) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** Tighten to 9 N•m (80 lb in)
7	A/Trans Fluid Pump Bolt M6 x 1.0 x 45 (Qty: 1) **Tighten** Tighten to 9 N•m (80 lb in)

Transmission Fluid Filter Installation

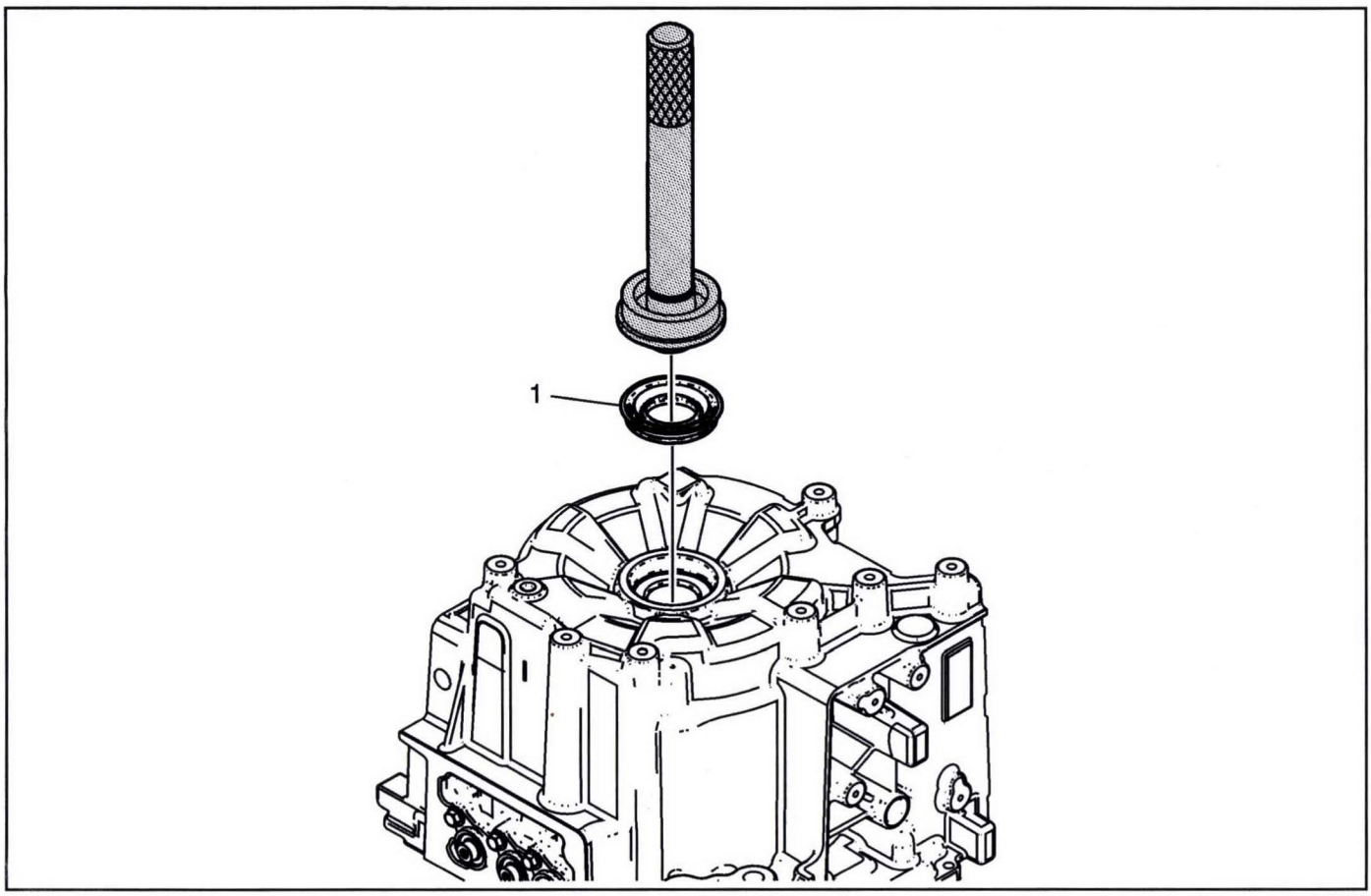


2899187

Transmission Fluid Filter Installation

Callout	Component Name
1	A/Trans Fluid Filter Seal **Special Tools** • *GE-7079-2* Universal Driver Handle - Non-Threaded • *J-42737* Sector Bearing Installer For equivalent regional tools, refer to *Special Tools on page 16-96*.
2	A/Trans Fluid Filter Assembly
3	A/Trans Fluid Filter Bolt M6 x 1.0 x 20 (Qty: 1) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** Tighten to 9 N•m (80 lb in)

Front Wheel Drive Shaft Oil Seal Installation - Left Side

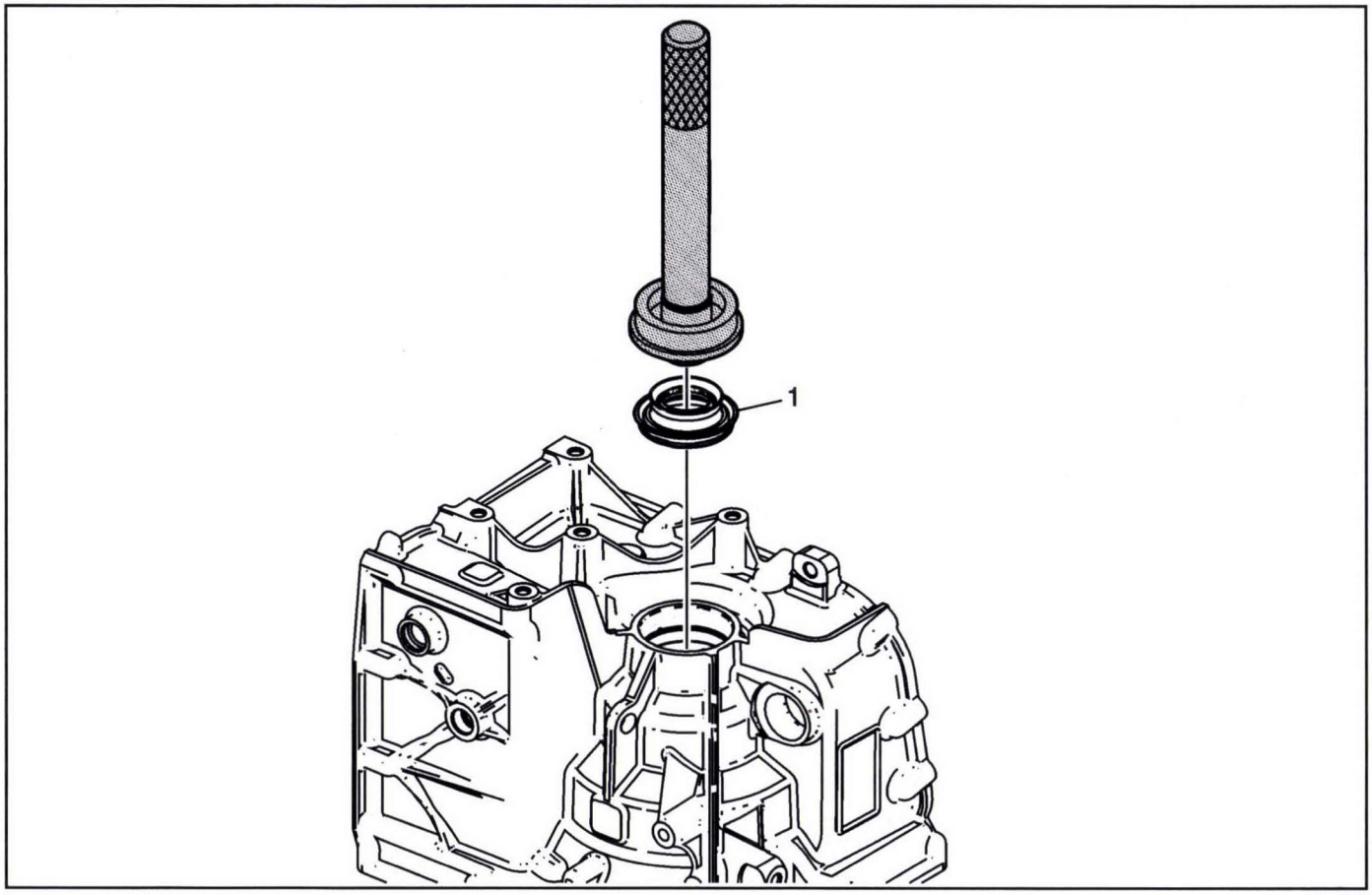


3401631

Front Wheel Drive Shaft Oil Seal Installation - Left Side

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal Assembly (LHS) **Special Tools** • *DT-46629-A* Axle Seal Installer • *GE-8092* Driver Handle For equivalent regional tools, refer to *Special Tools on page 16-96.*

Front Wheel Drive Shaft Oil Seal Installation - Right Side

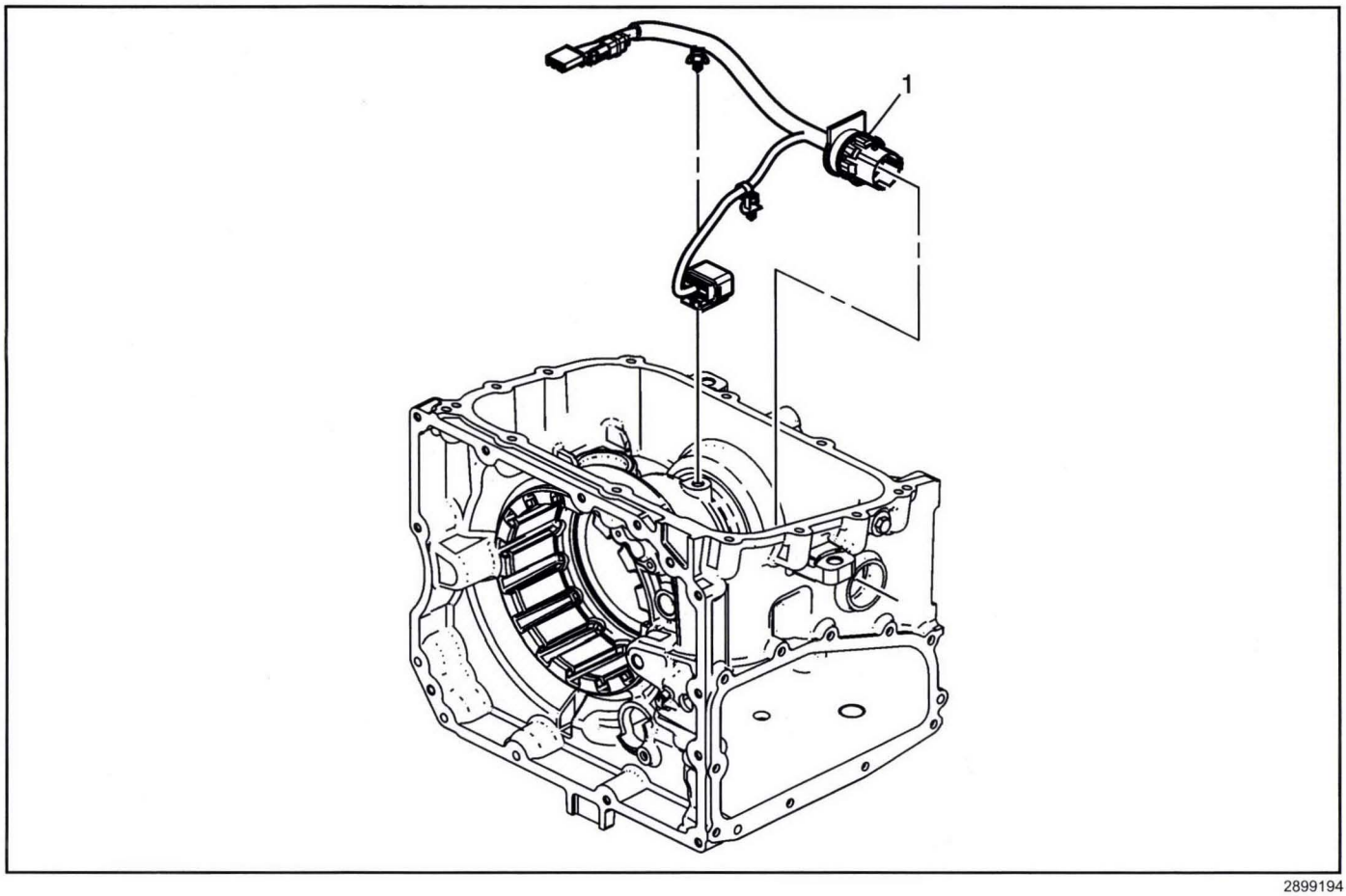


2899189

Front Wheel Drive Shaft Oil Seal Installation - Right Side

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal Assembly (RHS) **Special Tools** • *DT-46629-A* Axle Seal Installer • *GE-8092* Driver Handle For equivalent regional tools, refer to *Special Tools on page 16-96*.

Transmission Control Wiring Harness Installation

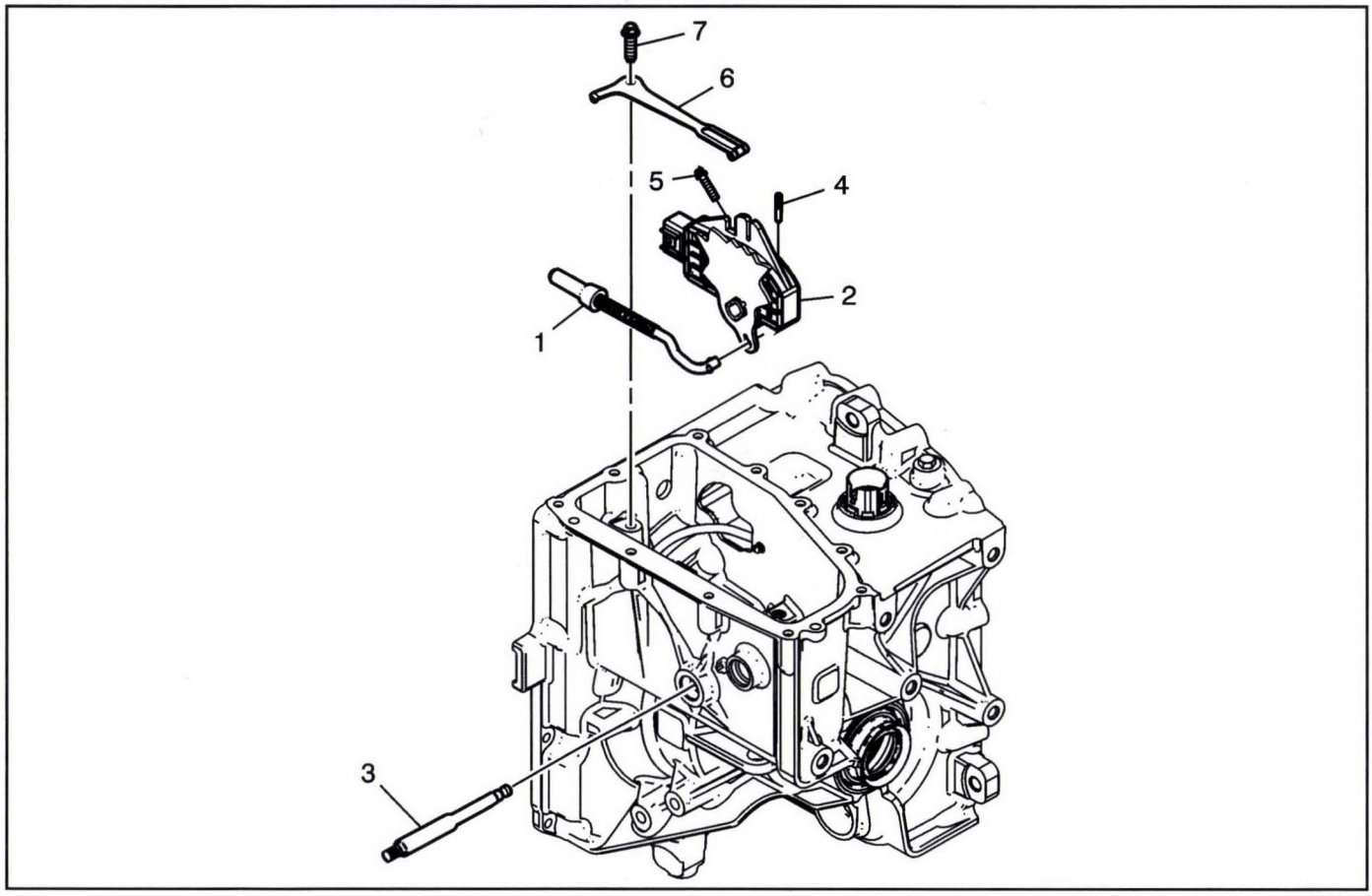


2899194

Transmission Control Wiring Harness Installation

Callout	Component Name
1	A/Trans Control Wiring Harness Assembly

Manual Shift Shaft Position Switch Installation

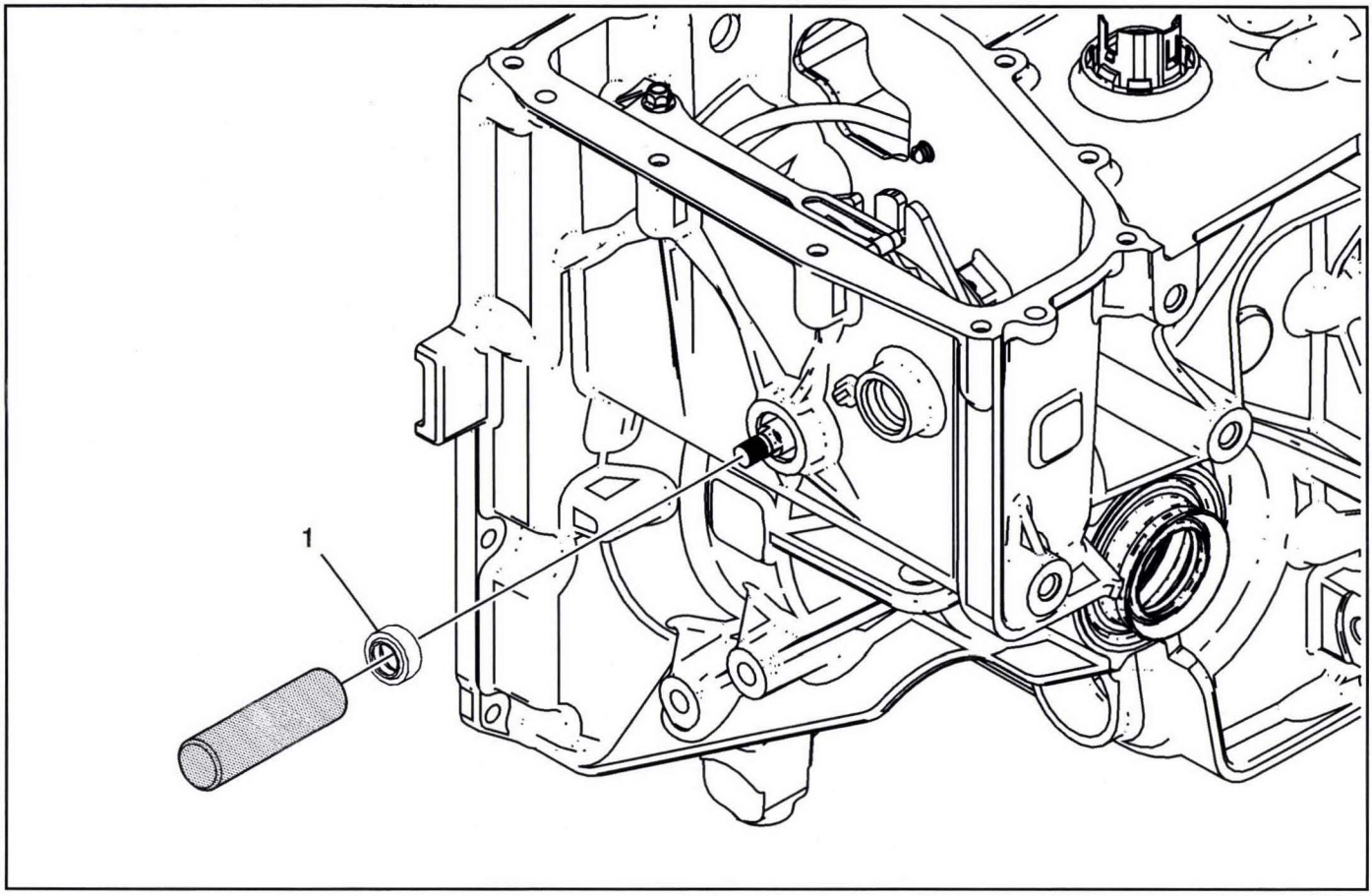


2899198

Manual Shift Shaft Position Switch Installation

Callout	Component Name
1	Park Pawl Actuator Assembly
2	A/Trans Manual Shift Shaft Position Switch Assembly
3	Manual Shift Shaft **Note:** The manual shift shaft seal must be replaced if replacing the manual shift shaft. Refer to *Manual Shift Shaft Seal Removal on page 16-69* or *Manual Shift Shaft Position Switch Installation on page 16-82*.
4	Manual Shift Shaft Pin
5	A/Trans Manual Shift Shaft Position Switch Bolt M5 x 0.8 x 20 (Qty: 1) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** Tighten to 8 N•m (71 lb in)
6	Manual Shift Detent Assembly
7	Manual Shift Detent Spring Bolt M6 x 1.0 x 25.65 (Qty: 1) **Tighten** Tighten to 9 N•m (80 lb in)

Manual Shift Shaft Seal Installation

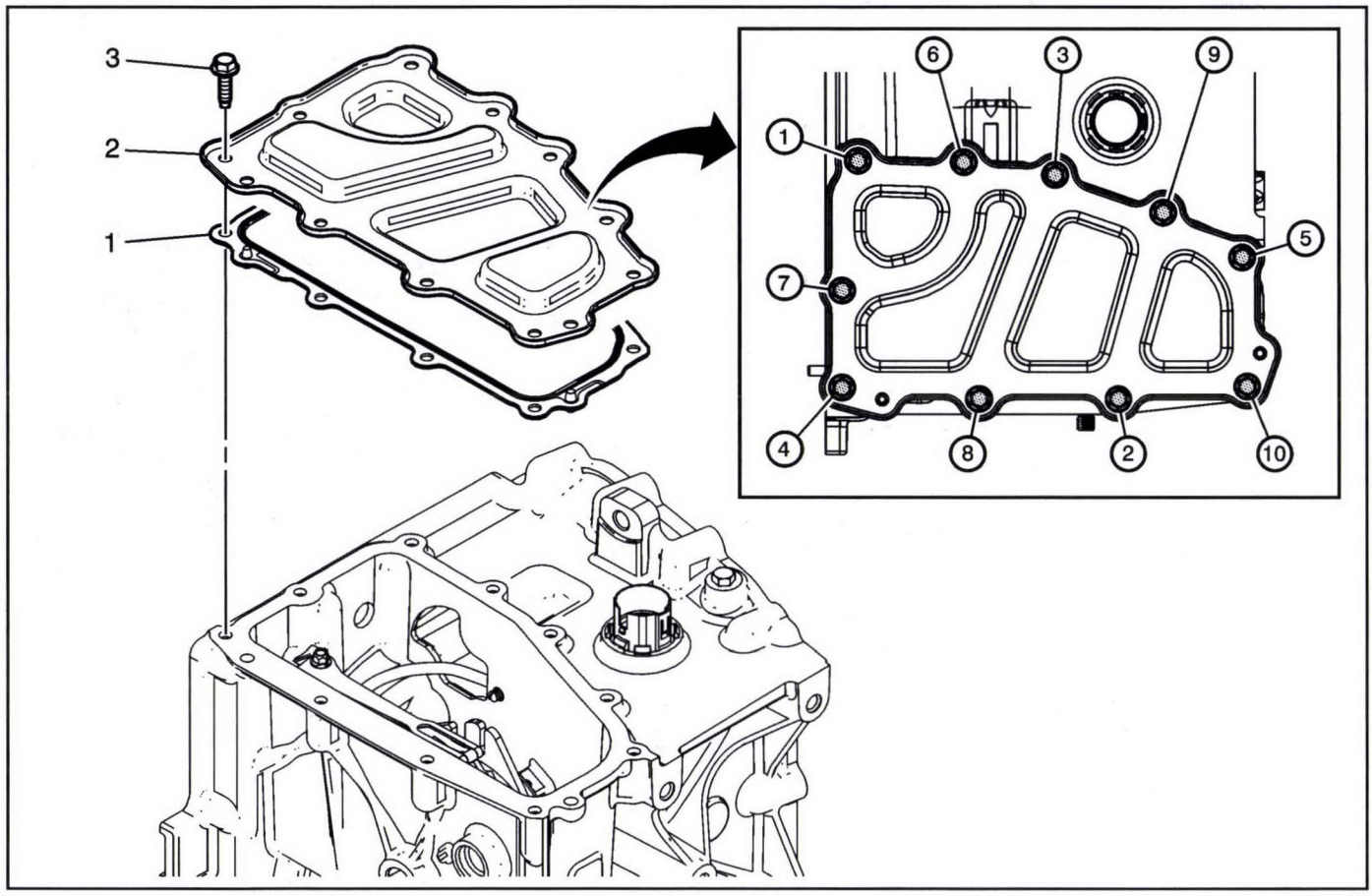


3331750

Manual Shift Shaft Seal Installation

Callout	Component Name
1	Manual Shift Shaft Seal **Note:** Install NEW seal. It is not reusable. **Special Tools** *DT-49101* Seal Installer For equivalent regional tools, refer to *Special Tools on page 16-96*.

Shift Shaft Cover Installation

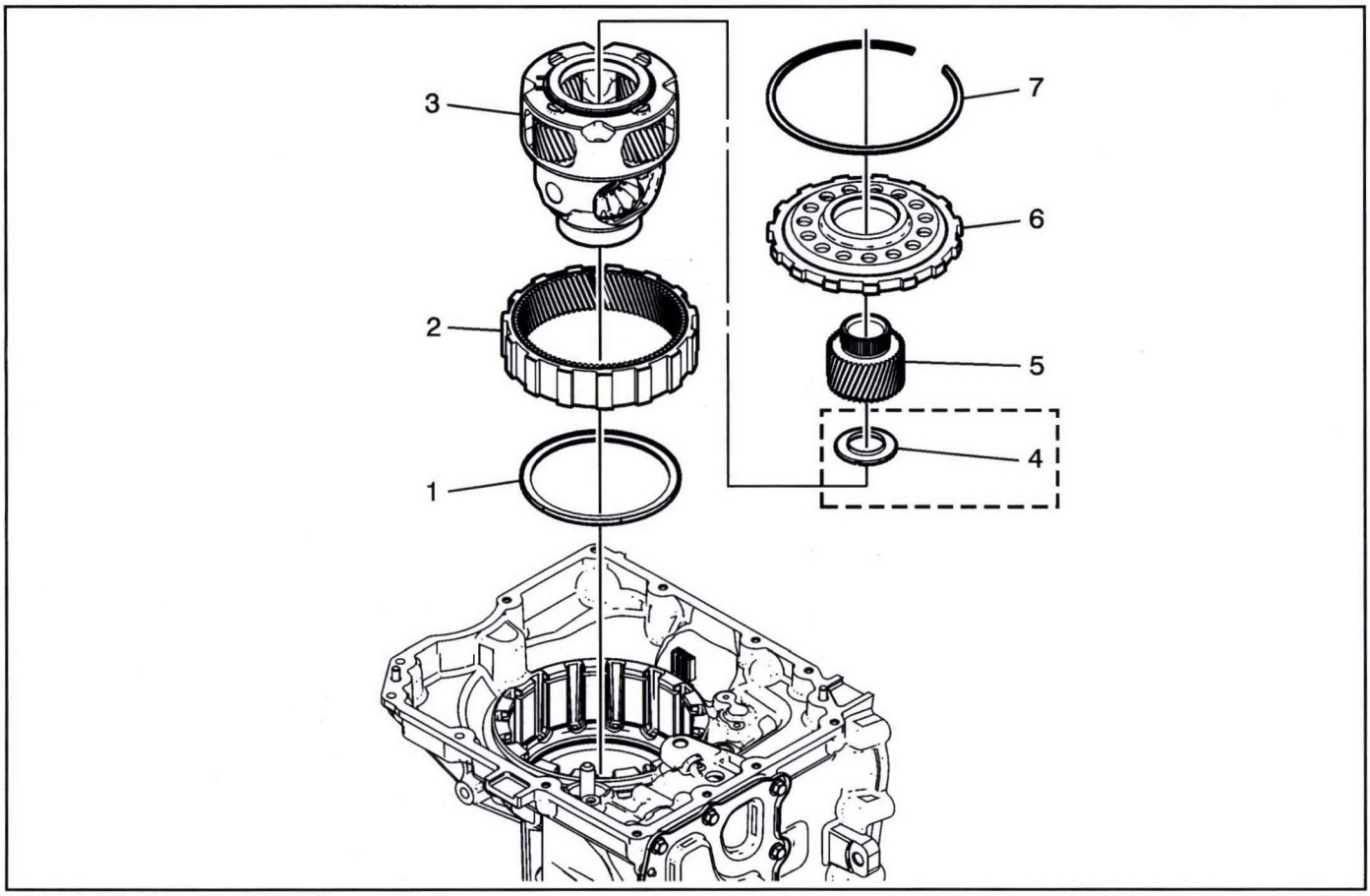


2899201

Shift Shaft Cover Installation

Callout	Component Name
1	Shift Control Shaft Cover Gasket
2	Shift Shaft Cover
3	Shift Shaft Detent Spring Cover Bolt M6 x 1.0 x 25 (Qty: 10) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** Tighten to 9 N•m (80 lb in)

Front Differential Carrier Installation

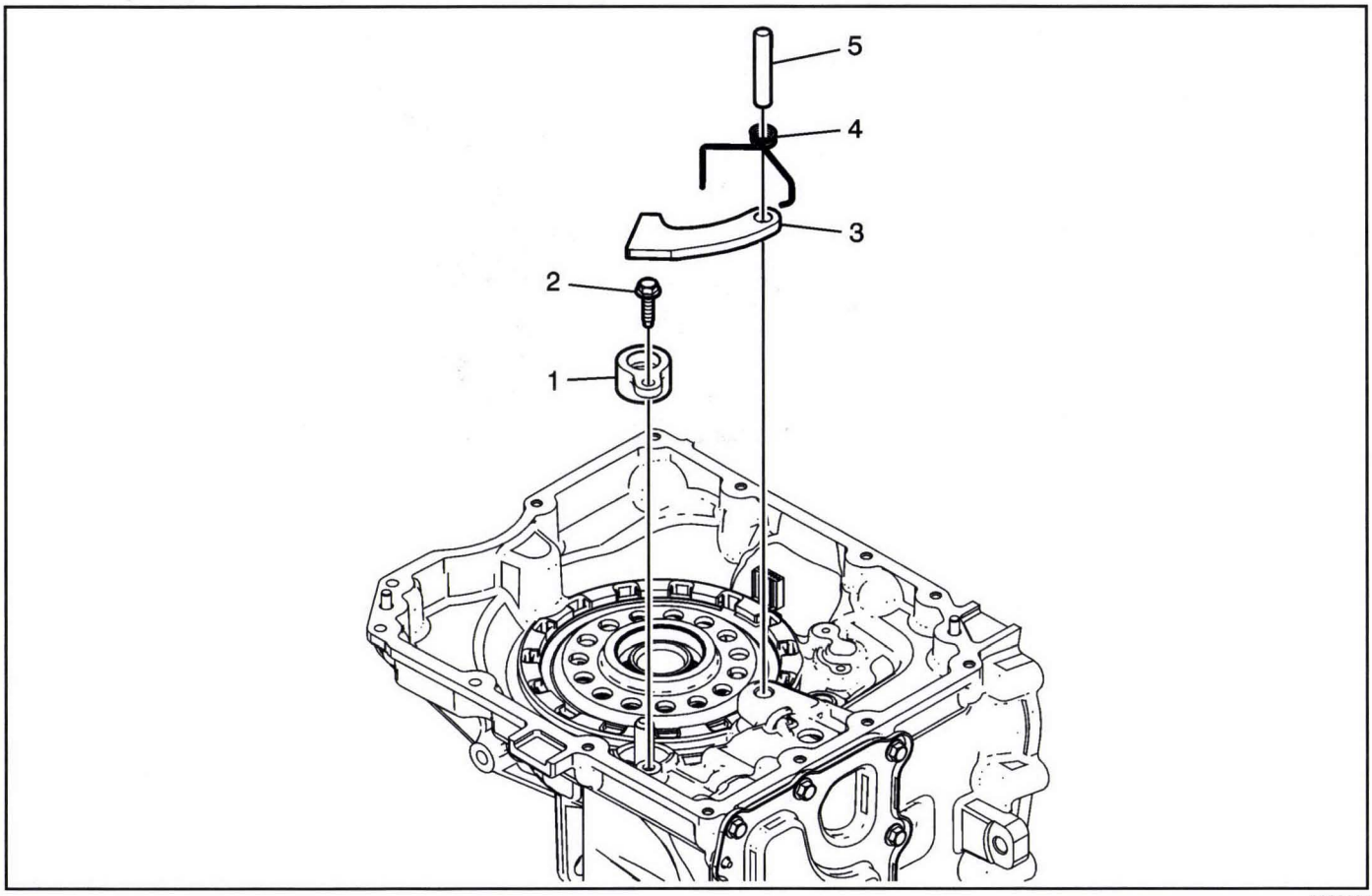


2899203

Front Differential Carrier Installation

Callout	Component Name
1	Front Differential Carrier Bearing (RHS)
2	Front Differential Ring Gear
3	Front Differential Carrier Assembly
4	Front Differential Carrier Sun Gear Thrust Bearing (Model Dependent)
5	Front Differential Carrier Sun Gear
6	Park Gear Hub Assembly
7	Front Differential Ring Gear Retainer

Park Pawl Installation

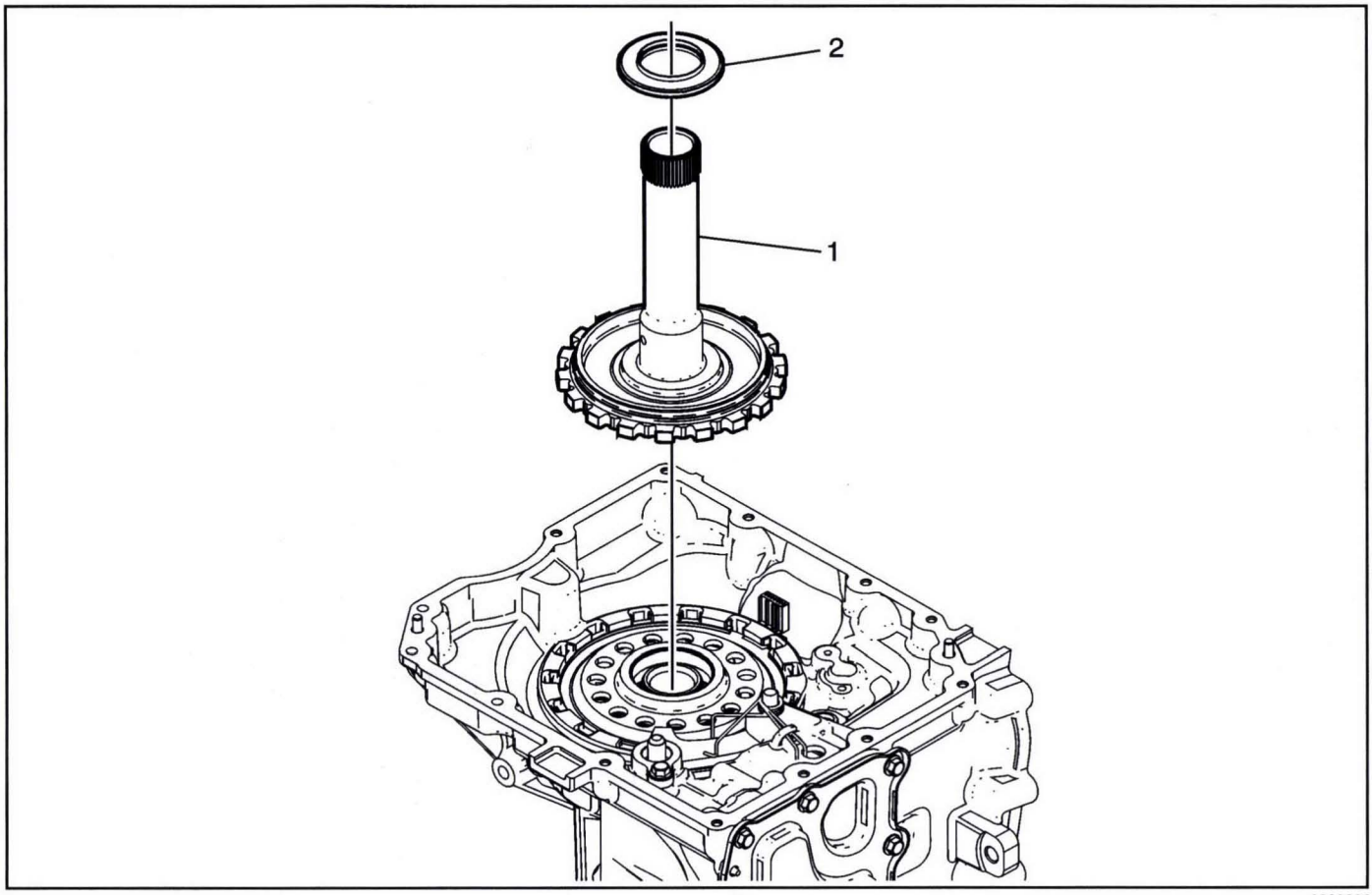


2899205

Park Pawl Installation

Callout	Component Name
1	Park Pawl Actuator Guide
2	Park Pawl Actuator Guide Bolt M6 x 1.0 x 25 (Qty: 1) **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** Tighten to 9 N•m (80 lb in)
3	Park Pawl
4	Park Pawl Spring
5	Park Pawl Shaft

Main Shaft Installation

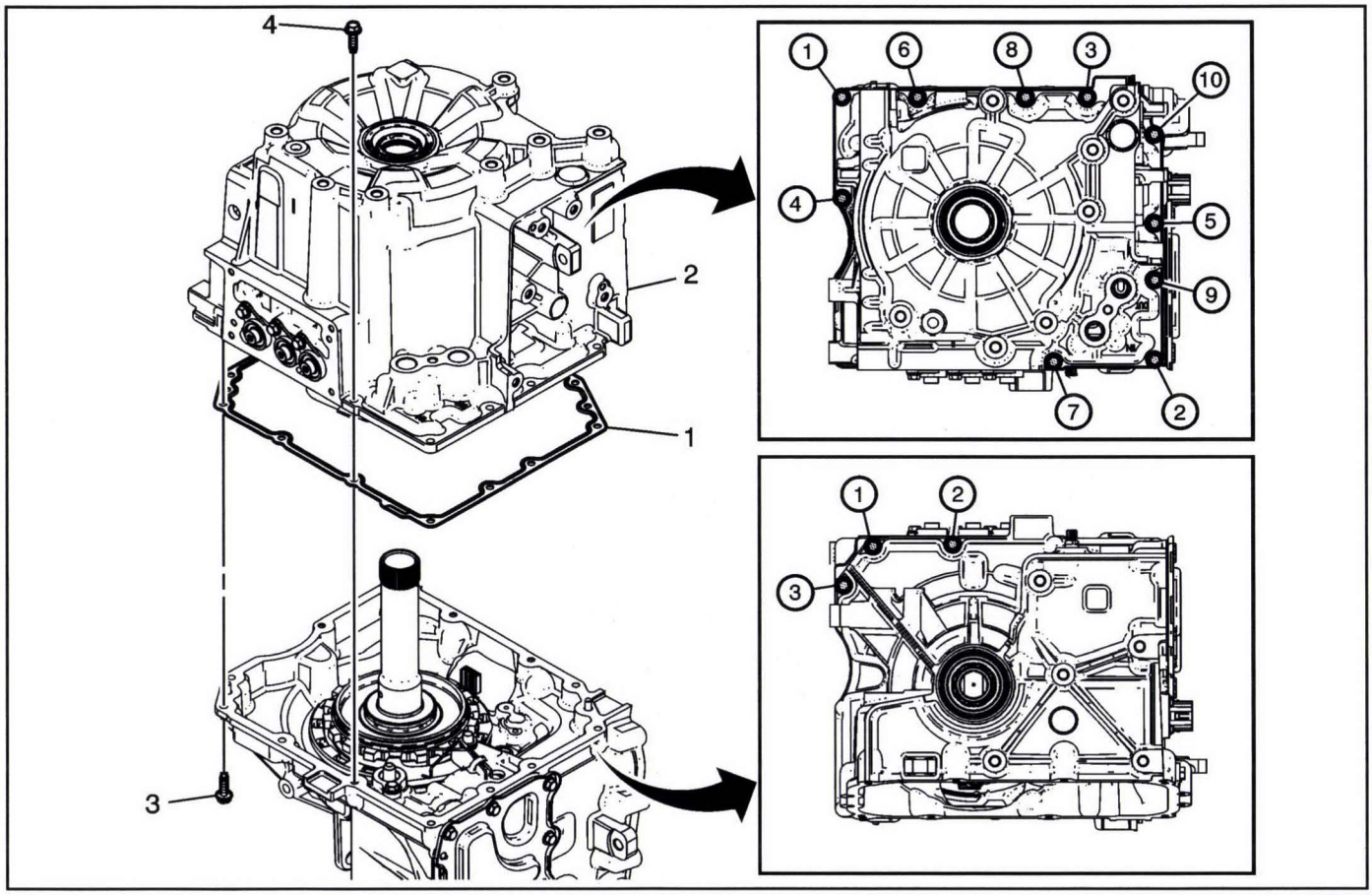


2899208

Main Shaft Installation

Callout	Component Name
1	Main Shaft
2	Front Differential Carrier Bearing (LHS)

Drive Motor Housing Installation

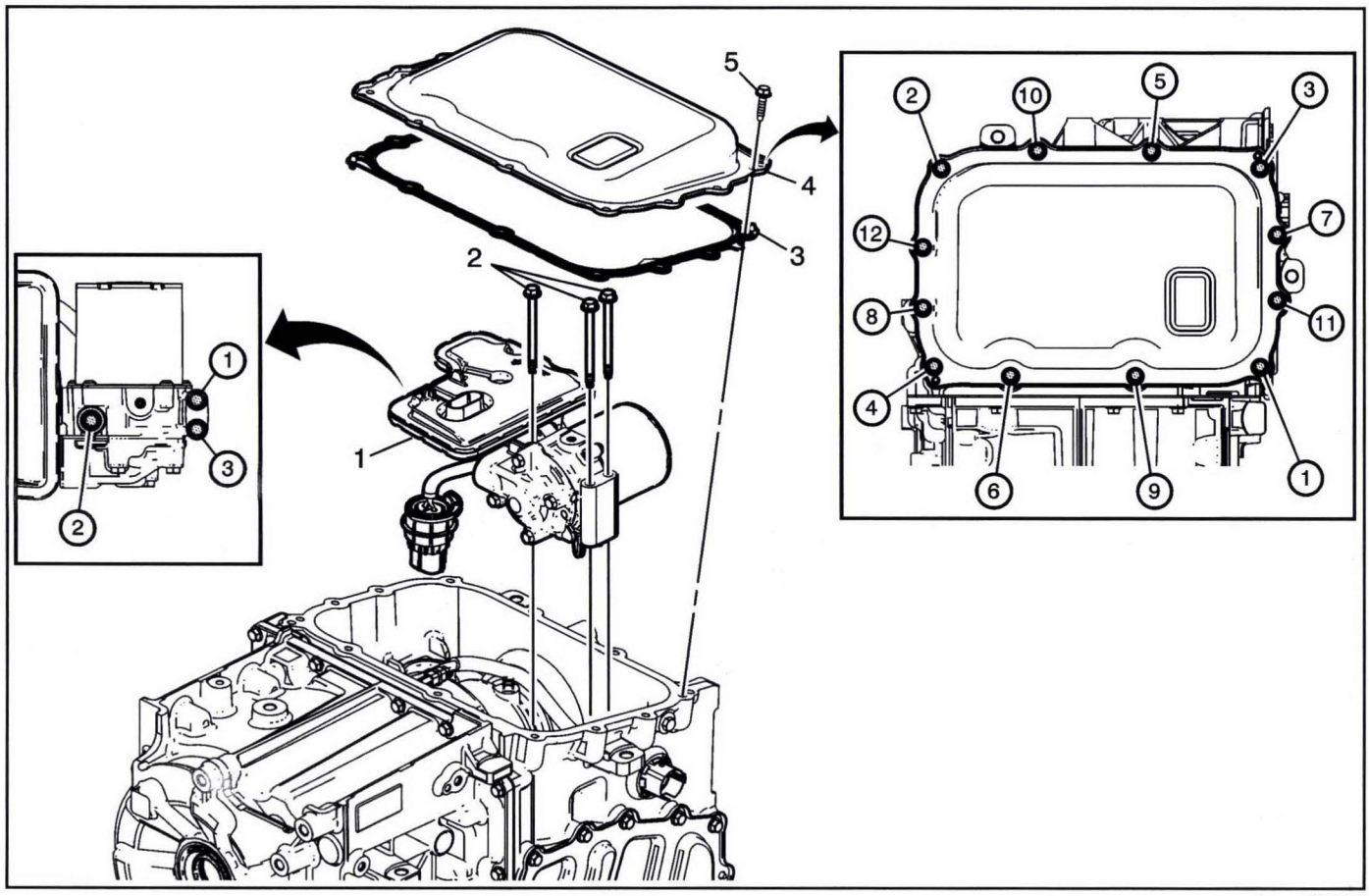


2899209

Drive Motor Housing Installation

Callout	Component Name
1	A/Trans Case Gasket **Note:** Install NEW gasket. It is not reusable.
2	Drive Motor Housing Assembly
3	A/Trans Case Bolt M6 x 1.0 x 25 (Qty: 3) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** Tighten to 9 N•m (80 lb in)
4	A/Trans Case Bolt M6 x 1.0 x 25 (Qty: 10) **Tighten** Tighten to 9 N•m (80 lb in)

Transmission Fluid Pan and Fluid Pump Installation

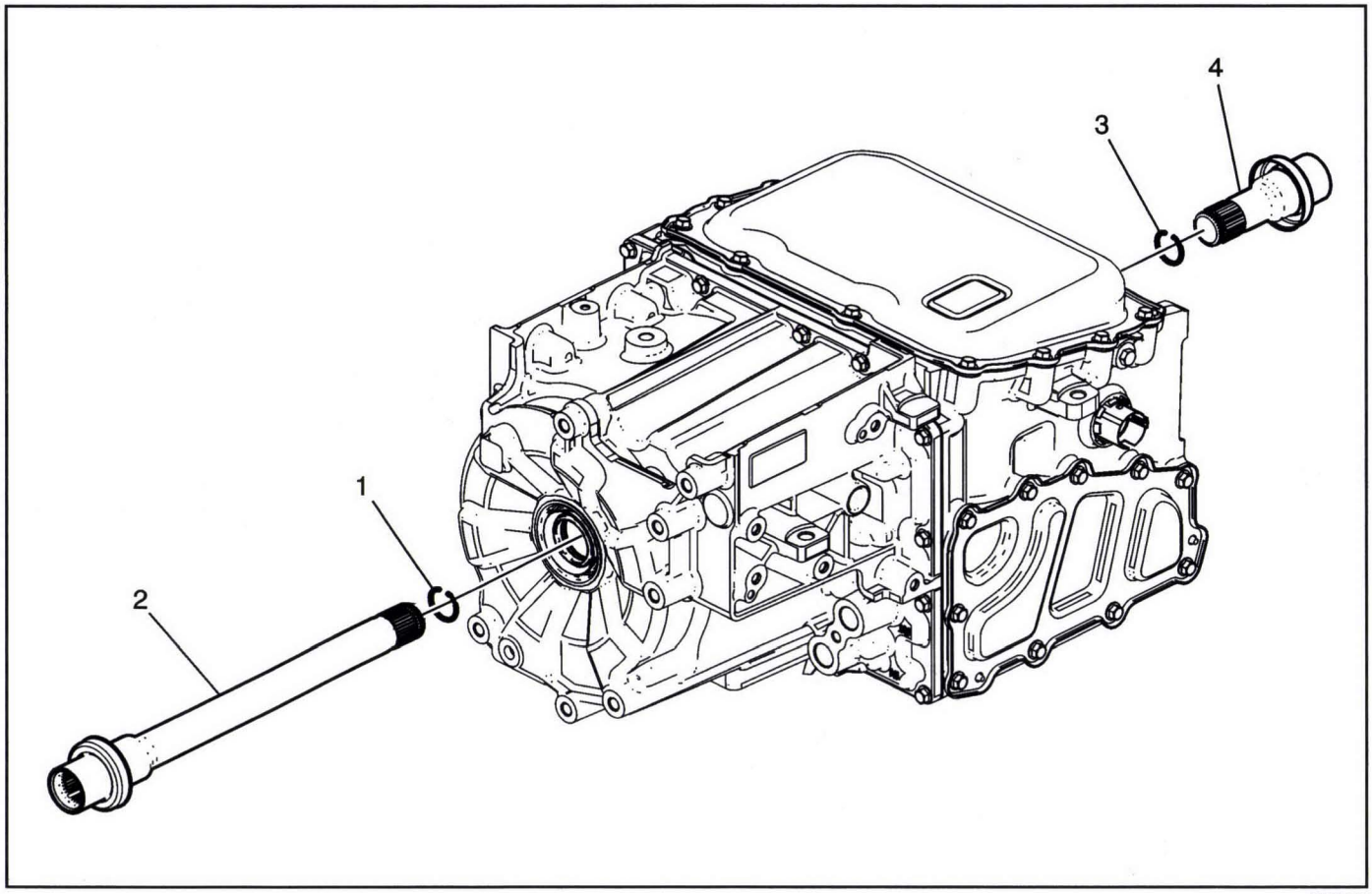


2899211

Transmission Fluid Pan and Fluid Pump Installation

Callout	Component Name
1	A/Trans Fluid Pump Assembly **Procedure** Insert the A/Trans fluid pump motor cable into the case until seated.
2	A/Trans Fluid Pump Bolt M6 x 1.0 x 85.65 (Qty: 3) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** Tighten to 9 N•m (80 lb in)
3	A/Trans Fluid Pan Gasket **Note:** Install NEW gasket. It is not reusable.
4	A/Trans Fluid Pan
5	A/Trans Fluid Pan Bolt M6 x 1.0 x 25 (Qty: 12) **Tighten** Tighten to 9 N•m (80 lb in)

Output Shaft Installation

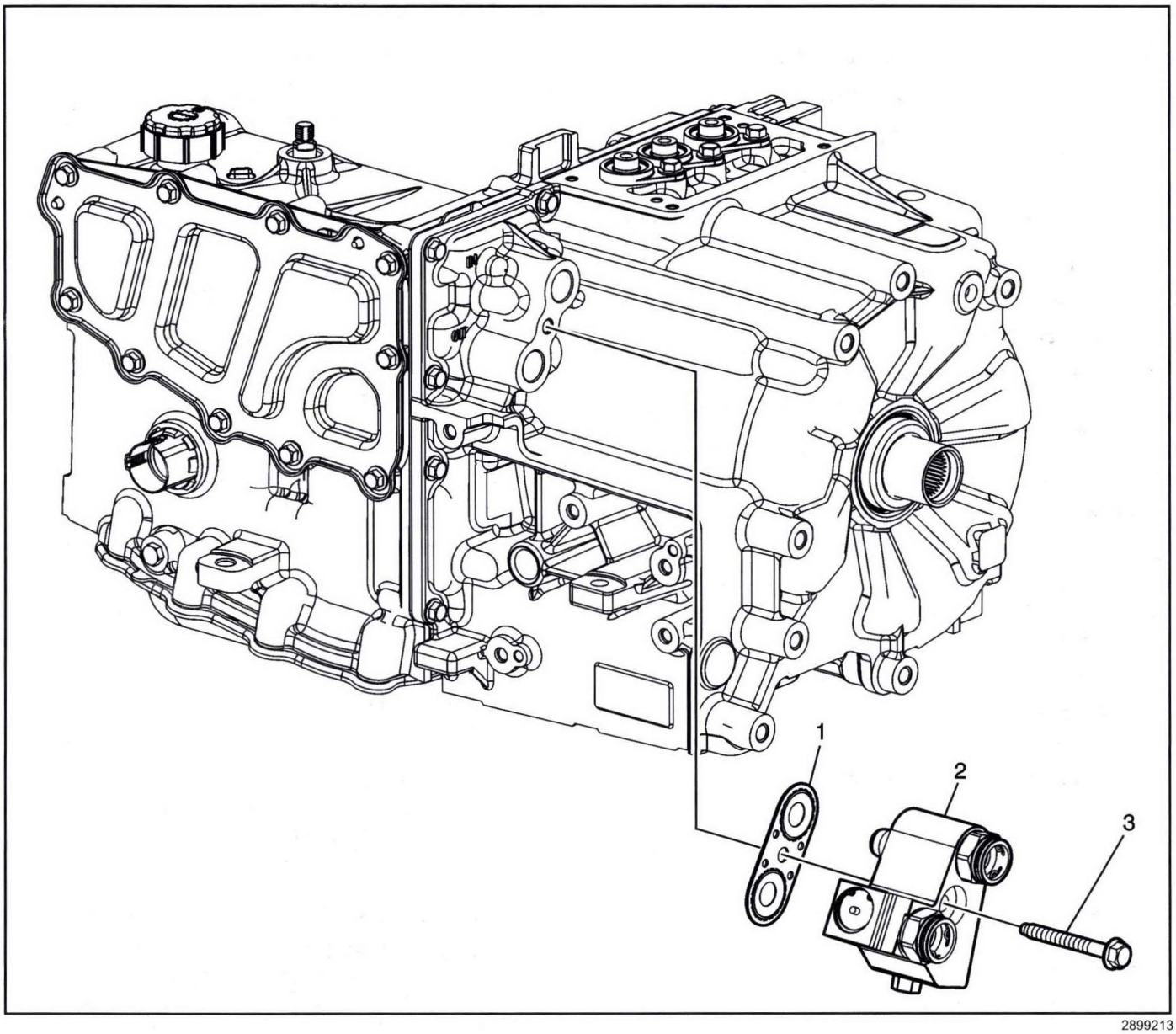


2899212

Output Shaft Installation

Callout	Component Name
1	Output Shaft Retaining Ring **Note:** • Install a new output shaft retaining ring. • For easier installation of the output shaft, face the air gap on the output shaft retaining ring downward.
2	Output Shaft Assembly (LHS)
3	Output Shaft Retaining Ring **Note:** • Install a new output shaft retaining ring. • For easier installation of the output shaft, face the air gap on the output shaft retaining ring downward.
4	Output Shaft Assembly (RHS)

Transmission Fluid Cooler Bypass Valve Installation



2899213

Transmission Fluid Cooler Bypass Valve Installation

Callout	Component Name
1	Transmission Fluid Cooler Thermal Bypass Valve Gasket **Note:** Install a new gasket. It is not reusable.
2	Transmission Fluid Cooler Bypass Valve
3	Transmission Fluid Cooler Thermal Bypass Valve Bolt M8 x 1.25 x 65.8 (Qty :1) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** Tighten to 22 N•m (16 lb ft)

Description and Operation

Definitions and Abbreviations

Propulsion Condition Definitions

Chuggle/Cogging: A bucking or jerking condition.

Shudder: A repeating jerking condition similar to Chuggle/Cogging but more severe and rapid. This condition may be most noticeable during certain ranges of vehicle speed.

Surge: A repeating condition of acceleration and deceleration that is less intense than Chuggle/Cogging.

Noise Conditions

Propulsion System Noise:

A whine or growl that increases or fades with vehicle speed, and is most noticeable under a light acceleration. It may also be noticeable in PARK or NEUTRAL operating ranges with the vehicle stationary.

Final Drive Noise: A hum related to vehicle speed which is most noticeable under a light acceleration.

Pump Noise: A high pitched whine or growl that is noticeable only when the auxiliary transmission fluid pump is ON. This condition may also be noticeable in all operating ranges with the vehicle moving.

Transmission Abbreviations

AC: Alternating Current

DC: Direct Current

DLC: Diagnostic Link Connector

DMM: Digital Multimeter

DTC: Diagnostic Trouble Code

EBCM: Electronic Brake Control Module

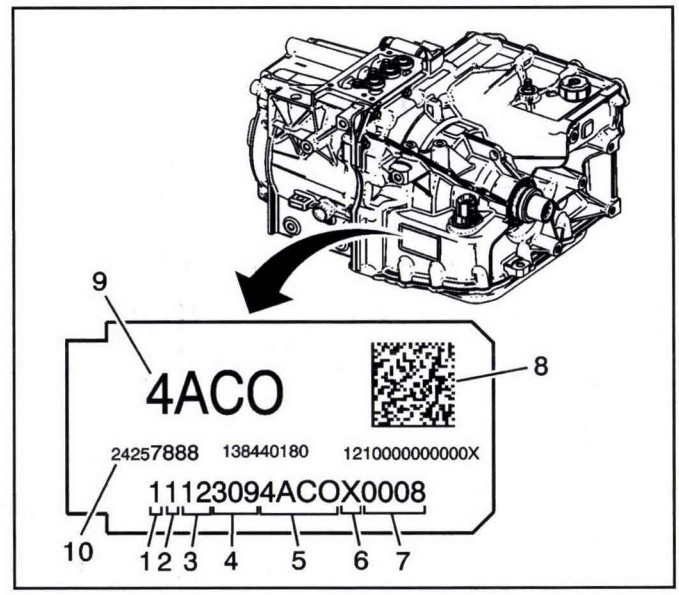
EMI: Electromagnetic Interference

MIL: Malfunction Indicator Lamp

OBD: On Board Diagnostic

VSS: Vehicle Speed Sensor

Transmission Identification Information



2899216

Legend

(1)	Line ID
(2)	Shift ID
(3)	Build Year
(4)	Julian Date
(5)	Broadcast Code
(6)	Reserved Use
(7)	Sequence Number
(8)	Machine Readable Matrix
(9)	Broadcast Code
(10)	GM Part Number

Transmission General Description

The Chevy Spark EV is a fully electric vehicle. The propulsion of the vehicle is achieved by an electric drive Transmission. The Transmission is a fully automatic, front wheel drive transaxle, variable-speed, electronic-controlled transmission. It consists primarily of an 85kW drive motor, 1 planetary/differential gear set, high voltage electric auxiliary transmission fluid pump and housing, and 2 axles.

The planetary gear set provides the fixed forward and reverse ratio. Changing speed and torque is fully automatic and is accomplished through the use of a drive motor generator power inverter control module located under hood. The drive motor generator power inverter control module receives and monitors various electronic sensor inputs and uses this information to vary the torque output to the drive axles based on throttle position.

The hydraulic system uses an electric auxiliary fluid pump motor assembly located inside of the transmission for cooling and lubrication of rotating components. This is a gerotor-type pump, electric 3 phase High Voltage motor, electric harness, and control module. The control module is located inside of the drive motor generator power inverter module under

the hood. The transmission fluid pump operates under low pressure and will only run when out of park or neutral and vehicle speed is detected.

The transmission hydraulic system also contains a transmission fluid temperature sensor. The transmission fluid temperature sensor is internal to the transmission and is located near the transmission fluid oil filter. The transmission fluid temperature sensor is connected to the ECM. The ECM sends the fluid temperature data to the drive motor power inverter module for drive motor torque.

The transmission may be operated in any of the following gear ranges:

PARK (P): This position locks the wheels and prevents the vehicle from rolling either forward or backward. PARK is the best position to use when starting the propulsion system for the vehicle. Because the transmission utilizes a shift lock control system, it is necessary to fully depress the brake pedal before shifting out of PARK. For safety reasons, use the parking brake in addition to the PARK position.

REVERSE (R): This position allows the vehicle to be operated in a rearward direction by reversing the rotation of the electric drive motor.

NEUTRAL (N): This position allows the vehicle to be moved without the park pawl engaged.

DRIVE (D): Drive range should be used for all normal driving conditions for maximum efficiency and range economy. Drive range allows the drive unit to operate in a forward direction by electrically varying the output torque and speed of the electric drive motor.

Low (L): This position is used for the "feel" of engine braking and can be used for the slowing of the vehicle once the throttle is lifted. While in the position the vehicle will slow quicker and use the motor to more aggressively collect energy during a regenerative braking event.

Transmission Component and System Description

The mechanical components of the Spark EV MME 1ET35 are as follows:

- Gerotor type fluid pump assembly
- Drive motor housing assembly
- Drive motor assembly 85 kW
- Transmission case assembly
- Front differential carrier assembly
- Center support assembly
- Output shaft assembly (LHS)
- Output shaft assembly (RHS)
- Park pawl

The electrical components of the Spark EV MME 1ET35 are as follows:

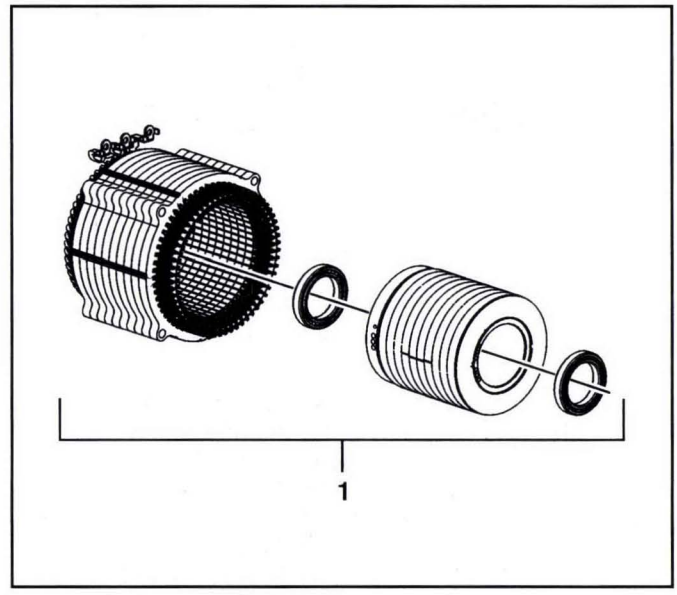
- Drive Motor, 85 kW
- Manual Shift Shaft Position Sensor is also referred to as the Transmission Internal Mode Switch.
- Electric Auxiliary Fluid Pump Motor Assembly
- Transmission Fluid Temperature Sensor
- Drive Motor Position Sensor
- Transmission Control Wiring Harness Assembly

Transmission Indicators and Messages

No transmission-related indicators or messages are displayed on the instrument panel cluster (IPC). For a complete listing and description of all vehicle indicators and messages, refer to *Indicator/Warning Message Description and Operation on page 8-100*.

Electronic Component Description

Drive Motor

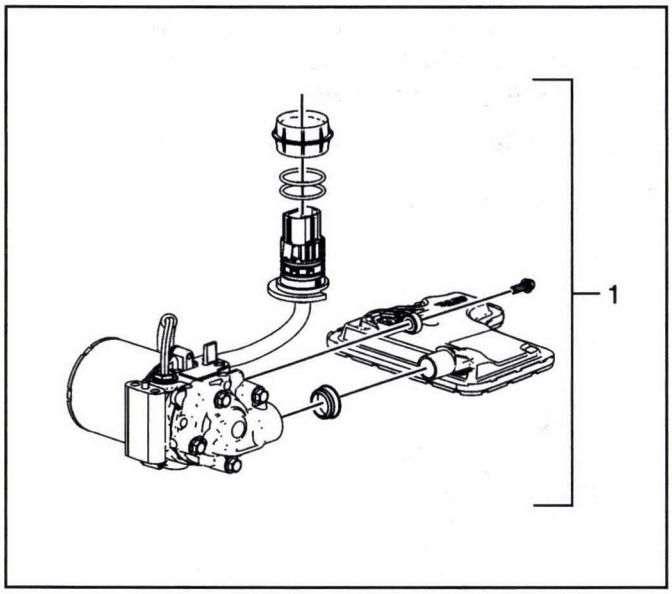


3242611

The drive motor (1) is a permanent magnet 85 Kw peak power electric machine and is controlled by the power inverter module, often referred to as the drive motor generator power inverter module, in order to provide torque for vehicle propulsion and regenerative braking. Drive motor speed is controlled and monitored by a resolver-type position sensor. The drive motor position sensor is monitored by the drive motor generator power inverter module . The drive motor generator power inverter module monitors the angular position, speed and direction of the drive motor based upon the signals the position sensor outputs to the drive motor generator power inverter module . The drive motor position sensor, or resolver, contains a drive coil, 2 driven coils and an irregular shaped metallic rotor. The metallic rotor is mechanically attached to the shaft of the drive motor generator. When the vehicle is ON, the drive motor generator power inverter module outputs a 5 V AC, 10 kHz excitation signal to the drive coil. The drive coil excitation signal creates a magnetic field surrounding the 2 driven coils and the irregular shaped rotor. The drive motor generator power inverter module then monitors the 2 driven coil circuits for a return signal. The position of the irregular shaped metallic rotor causes the magnetically-induced return signals of the driven coils to vary in size and shape. A comparison of the 2 driven coils signals allows the motor control module to determine the exact angle, speed and

direction of the drive motor. For more information, refer to *Drive Motor Generator Power Inverter Module Description and Operation on page 9-193*.

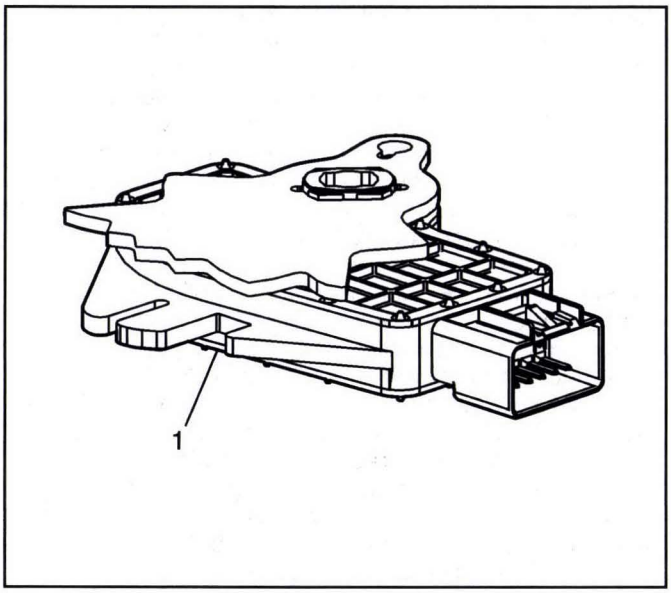
Electric Auxiliary Transmission Fluid Pump Motor



3242619

The electric auxiliary transmission fluid pump motor assembly (1) is driven by 360V alternating current which is controlled by the power inverter module. The purpose of the electric auxiliary transmission fluid pump motor assembly is to supply oil to the transmission for lube and cooling during vehicle operation. The electric auxiliary transmission fluid pump motor is commanded on when propulsion is active and vehicle speed is present.

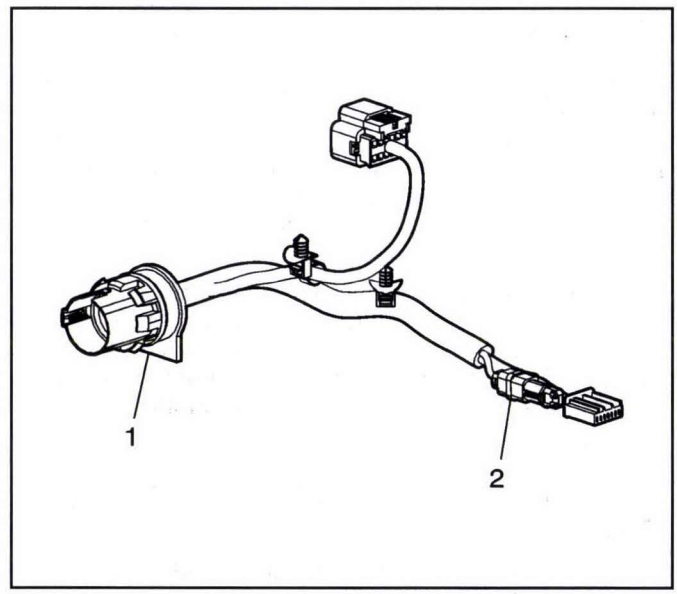
Transmission Internal Mode Switch



3242622

The Transmission Internal Mode Switch (1), also called the A/Trans Manual Shift Shaft Position Switch, is a dual sliding contact switch attached to the control valve body within the transmission. The nine outputs from the switch indicate which position is selected by the transmission manual shaft. Four outputs (A, B, C, P), are range selection inputs to the ECM. Five outputs (D1, D2, R1, R2, S) are direction selection inputs to the hybrid/EV powertrain control module 1 through the transmission X175 20-way connector. The input voltage at the modules is high when the switch is open and low when the switch is closed to ground. The state of each input is displayed on the scan tool as Internal Mode Switch Range and Internal Mode Switch Range Direction. The Internal Mode Switch Range input parameters represented on the scan tool as Internal Mode Switch A/B/C/P. The Internal Mode Switch Range Direction input parameters represented on the scan tool as Internal Mode Switch 2 – D1, D2, R1, R2, and S.

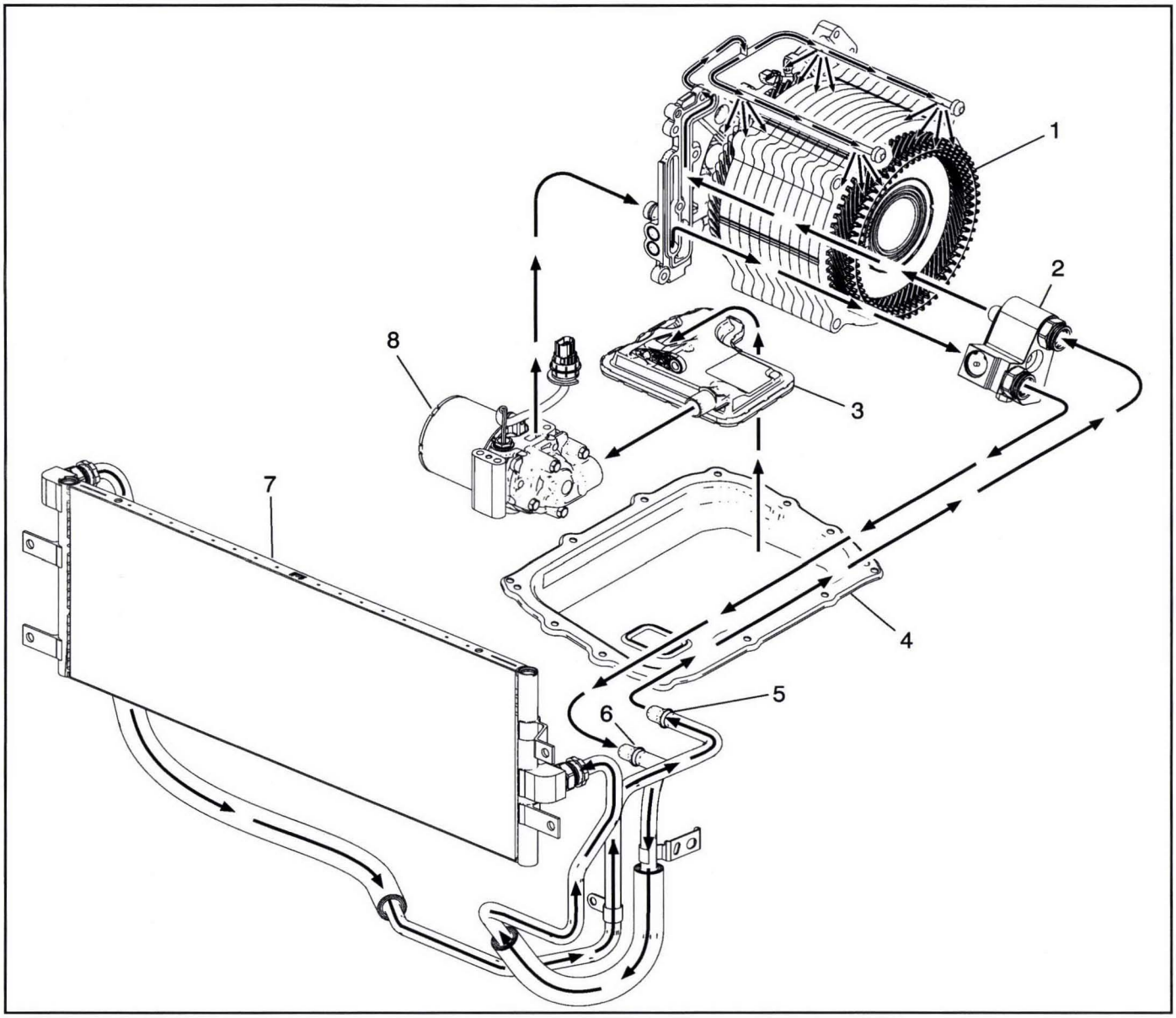
Transmission Fluid Temperature Sensor



3242626

The transmission fluid temperature sensor (2) is part of the A/Trans Control Wiring Harness Assembly (1) and can be serviced separately. The transmission fluid temperature sensor is connected to the ECM. The ECM sends the fluid temperature data to the power inverter module for drive motor torque.

Lubrication Description



3417930

1. Drive Motor Rotor/Stator Assembly
2. Transmission Fluid Cooler Bypass Valve
3. A/Trans Fluid Filter Assembly
4. A/Trans Fluid Pan
5. Transmission Fluid Cooler Return Line
6. Transmission Fluid Cooler Supply Line
7. Transmission Oil Cooler
8. A/Trans Fluid Pump Assembly

The primary source of heat in the transmission is the drive motor rotor/stator assembly (1) . The drive motor rotor/stator assembly is cooled by the transmission fluid. Transmission fluid is recirculated through the transmission by the fluid pump assembly (8) until it reaches the appropriate temperature to open the fluid cooler bypass valve (2) which then allows fluid to flow to the transmission oil cooler (7). Hot fluid exits the transmission and flows into the transmission oil cooler through the transmission fluid cooler supply line (6).

The cooled fluid returns to the transmission through the transmission fluid cooler return line (5). The fluid then enters two small pipes that direct the cooled fluid to a set of spray nozzles that spray the fluid onto the drive motor stator. Fluid then drains down to the fluid pan (4) and is drawn back into the fluid pump through the fluid filter (3).

Special Tools and Equipment

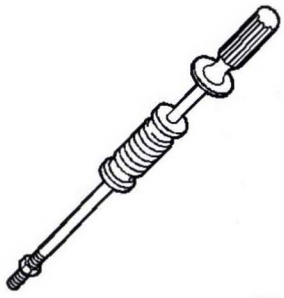
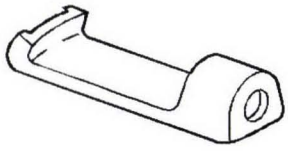
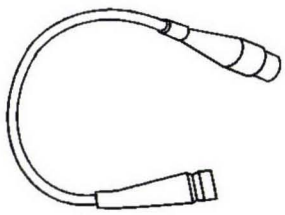
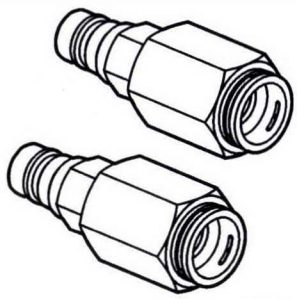
Illustration	Tool Number/Description
 177628	GE-6125-1B J-6125-1B Slide Hammer with Adapter
 36152	DT-23129 J-23129 Universal Seal Remover
 537322	DT-44152 Jumper Harness, 20 Terminal
 1215917	DT-45096 J-45096 Transmission Oil Cooler System Flush and Flow Test Tool
 3556377	DT-45096-23 TransFlow Adapters

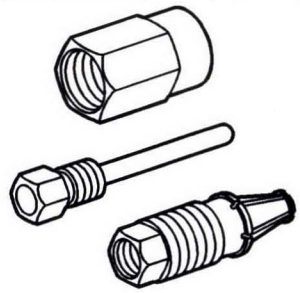
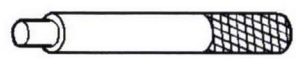
Illustration	Tool Number/Description
 792892	DT-45201 J-45201 Cooler Line Seal Remover
 1760607	DT-46629-A J-46629-A Axle Seal Installer
 2033666	DT-49101 Seal Installer
 997	GE-7079-2 J-7079-2 Universal Driver Handle - Non-Threaded
 2015	GE-8092 J-8092 Driver Handle

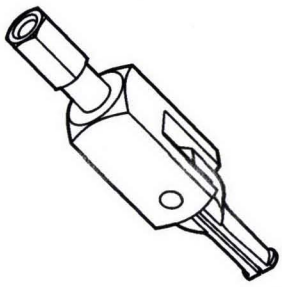
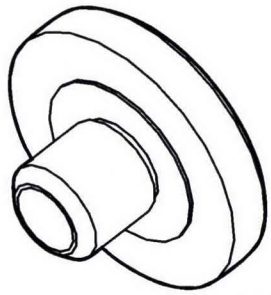
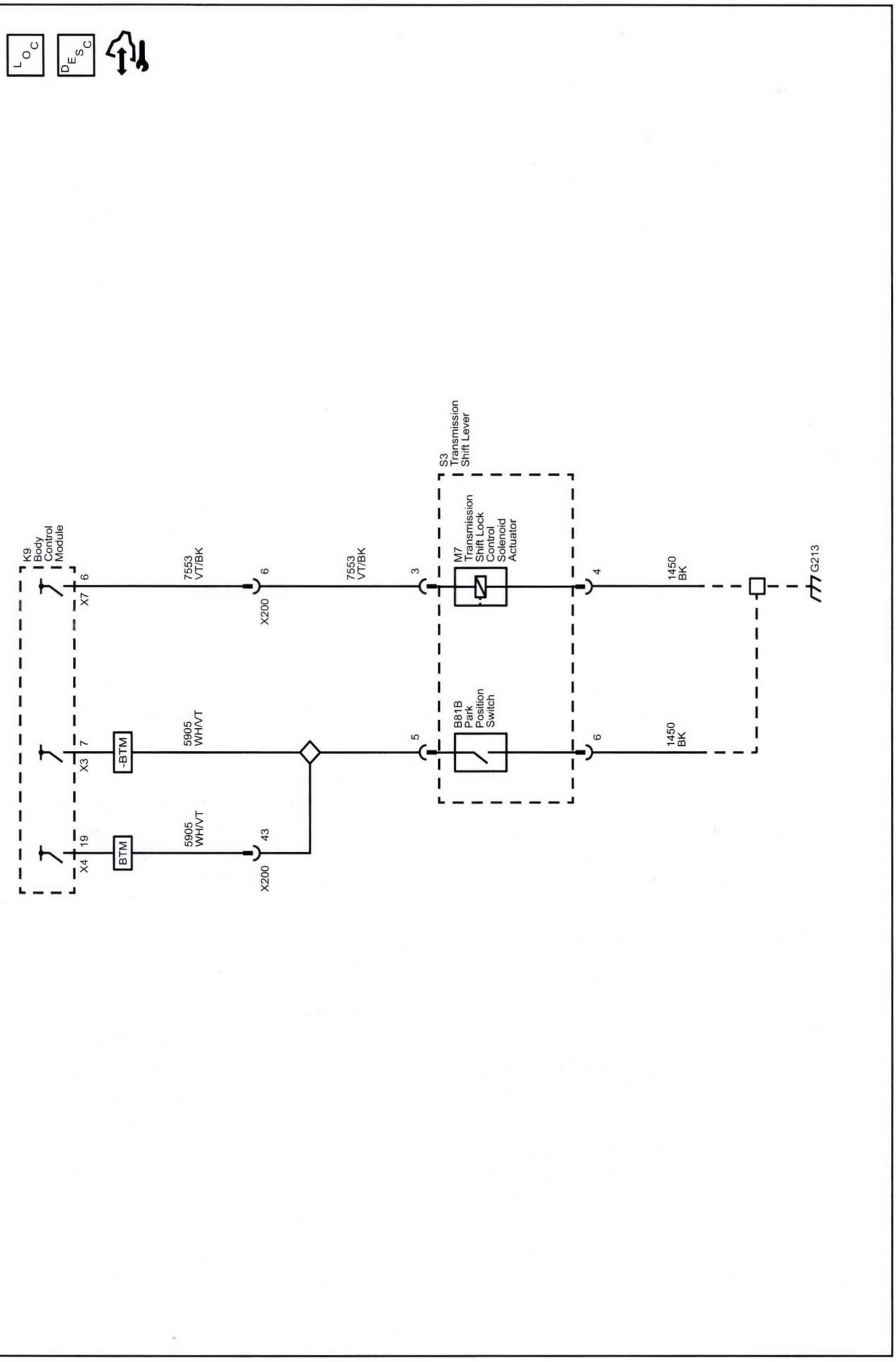
Illustration	Tool Number/Description
 2239966	GE-24731-206 J-24731-206 Tempil Stick
 1337354	J-23907 Bearing Adapter

Illustration	Tool Number/Description
 165714	J-42737 Sector Bearing Installer

Shift Lock Control

Schematic and Routing Diagrams

Shift Lock Control Schematics (Shift Lock Control)



Diagnostic Information and Procedures

DTC B270A

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

DTC Descriptors

DTC B270A: Park Lock Solenoid Control Circuit

For symptom byte information, refer to *Symptom Byte List on page 6-117*

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Fuse B+	1	1	—	—
Control	B270A 02	B270A 04	B270A 01	—
Ground	—	B270A 04	—	—
1. Transmission Control Lever Malfunction				

Circuit/System Description

The body control module (BCM) controls the transmission shift lock control solenoid actuator by providing a battery positive voltage to the solenoid when the brake pedal is applied. The BCM monitors the voltage and current flow of the control circuit.

Conditions for Running the DTC

- The ignition switch is in the ON position.
- The brake pedal is applied.
- The transmission is in the PARK position.
- The DTC runs continuously once the above conditions are met.

Conditions for Setting the DTC

B270A 01

The body control module detects a short to voltage in the transmission shift lock control solenoid actuator control circuit for 1 s.

B270A 02

The body control module detects a short to ground in the transmission shift lock control solenoid actuator control circuit for 1 s.

B270A 04

The body control module detects an open in the transmission shift lock control solenoid actuator control circuit for 1 s.

Action Taken When the DTC Sets

The body control module will not attempt to enable the voltage supply circuit of the automatic transmission park lock control solenoid until the next power switch cycle.

Conditions for Clearing the DTC

- A current DTC B270A will clear when the malfunction is no longer present and the power switch is cycled.
- A history DTC will clear after 100 ignition cycles with no current DTC active during the 100 power switch cycles.

Reference Information

Schematic Reference

- *Body Control System Schematics on page 11-14*
- *Shift Lock Control Schematics on page 16-99*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Automatic Transmission Shift Lock Control Description and Operation on page 16-103

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*

- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify the scan tool Brake Transmission Shift Interlock Solenoid Actuator Command parameter changes from Inactive to Active when the brake pedal is applied.

⇒ **If the Brake Transmission Shift Interlock Solenoid Actuator Command does not change**

Refer to *Stop Lamps Malfunction on page 4-164*

⇓ **If the Brake Transmission Shift Interlock Solenoid Actuator Command changes**

3. Verify the S3 Transmission Shift Lever moves out of the PARK position when the brake pedal is applied.

⇒ **If the S3 Transmission Shift Lever does not move out of the PARK position**

Refer to Circuit/System Testing.

⇓ **If the S3 Transmission Shift Lever does move out of the PARK position**

All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S3 Transmission Shift Lever. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode, connect a test lamp between the control circuit terminal 3 and the ground circuit terminal 4.
4. Verify the test lamp turns ON and OFF when commanding the Brake Transmission Shift Interlock Solenoid Actuator ON and OFF with a scan tool.

⇒ **If the test lamp is always OFF**

4.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.

4.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

4.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇓ If less than 2 Ω

4.4. Vehicle in Service Mode.

4.5. Verify a test lamp illuminates between each B+ and ignition circuit terminal at the control module harness connector.

⇒ If the test lamp does not illuminate, repair the circuit or fuse as necessary.

⇒ If the test lamp illuminates at each B+ and ignition circuit, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

4.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

4.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

5. Test or replace the S3 Transmission Shift Lever.

Component Testing

1. Install a 10 A fused jumper wire between the control terminal 3 and 12 V. Momentarily install a jumper wire between the ground terminal 4 and ground.
2. Verify the solenoid turns on & off/clicks, etc.

⇒ **If the solenoid does not turn on & off/clicks, etc.**

Replace the S3 Transmission Shift Lever.

⇓ **If the solenoid does turn on & off/clicks, etc.**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Transmission Control Replacement on page 16-34*
- *Control Module References on page 6-3* for control module replacement, programming, and setup.

Symptoms - Automatic Transmission Shift Lock Control

Note: The following steps must be completed before using the symptom tables.

1. Perform the *Diagnostic System Check - Vehicle on page 6-91* before using the Symptom Tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to *Automatic Transmission Shift Lock Control Description and Operation on page 16-103*.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the automatic transmission shift lock control. Refer to *Checking Aftermarket Accessories on page 11-871*.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-877*.

Symptom List

Refer to a symptom diagnostic procedure in order to diagnose the symptom:

Transmission Control Lever Malfunction on page 16-102

Transmission Control Lever Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Fuse B+	1	1	—	—
Control	1	1	2	—
Ground	—	1	—	—

1. Transmission shift lever will not move from PARK with the brake pedal applied.
2. Transmission shift lever will move from PARK without the brake pedal applied.

Circuit/System Description

The body control module (BCM) controls the transmission shift lock control solenoid actuator by providing a battery positive voltage to the solenoid when the brake pedal is applied. The BCM monitors the voltage and current flow of the control circuit.

Reference Information

Schematic Reference

- *Body Control System Schematics on page 11-14*
- *Shift Lock Control Schematics on page 16-99*

Connector End View Reference

Component Connector End Views on page 11-455

Description and Operation

Automatic Transmission Shift Lock Control Description and Operation on page 16-103

Electrical Information Reference

- *Circuit Testing on page 11-871*
- *Connector Repairs on page 11-895*
- *Testing for Intermittent Conditions and Poor Connections on page 11-877*
- *Wiring Repairs on page 11-883*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify the scan tool Brake Transmission Shift Interlock Solenoid Actuator Command parameter changes from Inactive to Active when the brake pedal is applied.

⇒ **If the Brake Transmission Shift Interlock Solenoid Actuator Command does not change**

Refer to *Stop Lamps Malfunction on page 4-164*

⇓ **If the Brake Transmission Shift Interlock Solenoid Actuator Command changes**

3. Verify the S3 Transmission Shift Lever moves out of the PARK position when the brake pedal is applied.

⇒ **If the S3 Transmission Shift Lever does not move out of the PARK position**

Refer to Circuit/System Testing.

⇓ **If the S3 Transmission Shift Lever does move out of the PARK position**

All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S3 Transmission Shift Lever. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.

⇒ **If 10 Ω or greater**

2.1. Vehicle OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Vehicle in Service Mode, connect a test lamp between the control circuit terminal 3 and the ground circuit terminal 4.
4. Verify the test lamp turns ON and OFF when commanding the Brake Transmission Shift Interlock Solenoid Actuator ON and OFF with a scan tool.

⇒ **If the test lamp is always OFF**

4.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.

4.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance

4.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇓ If less than 2 Ω

4.4. Vehicle in Service Mode.

4.5. Verify a test lamp illuminates between each B+ and ignition circuit terminal at the control module harness connector.

⇒ If the test lamp does not illuminate, repair the circuit or fuse as necessary.

⇒ If the test lamp illuminates at each B+ and ignition circuit, replace the K9 Body Control Module.

⇒ **If the test lamp is always ON**

4.1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module, Vehicle in Service Mode.

4.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

⇓ **If the test lamp turns ON and OFF**

5. Test or replace the S3 Transmission Shift Lever.

Component Testing

1. Install a 10 A fused jumper wire between the control terminal 3 and 12 V. Momentarily install a jumper wire between the ground terminal 4 and ground.
2. Verify the solenoid turns on & off/clicks, etc.

⇒ **If the solenoid does not turn on & off/clicks, etc.**

Replace the S3 Transmission Shift Lever.

⇓ **If the solenoid does turn on & off/clicks, etc.**

3. All OK

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Transmission Control Replacement on page 16-34*
- *Control Module References on page 6-3* for control module replacement, programming, and setup.

Description and Operation

Automatic Transmission Shift Lock Control Description and Operation

The automatic transmission park lock control system is a safety device that prevents an inadvertent shift out of PARK. The driver must press the brake pedal before moving the park lever out of the PARK position. The system consists of the following components:

- The automatic transmission shift lock control solenoid, is located within the automatic transmission shift lever.
- The body control module, which controls the voltage supply circuit of the park lock control solenoid.
- The engine control module.

The body control module controls the voltage to the automatic transmission shift lock control solenoid. The following conditions must be met before the body control module will supply voltage to the automatic transmission shift lock control solenoid.

- The ignition is in the ON position.
- The engine control module sends an input via serial data to the body control module indicating the transmission is in the PARK position.
- The body control module determines the brake pedal is applied according the brake pedal position.

Since the automatic transmission shift lock control solenoid is permanently grounded, the body control module supplies voltage to the automatic transmission shift lock control solenoid, unlocking the park lever allowing the driver to move the park lever out of the PARK position as the solenoid energizes. When the brake pedal is not applied, the body control module turns the control voltage output of the park lock control solenoid OFF, de-energizing the park lock control solenoid. The de-energized solenoid mechanically locks the park lever in the PARK position.

Transmission Cooling

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Transmission Fluid Auxiliary Cooler Bolt	6 N•m	53 lb in
Transmission Fluid Cooler Bypass Valve Bolt	22 N•m	16 lb ft
Transmission Fluid Cooler Inlet Pipe Bolt	30 N•m	22 lb ft
Transmission Fluid Cooler Outlet Pipe Bolt	23 N•m	17 lb ft
Transmission Fluid Cooler Pipe Connector	38 N•m	28 lb ft

Diagnostic Information and Procedures

Transmission Overheats

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-91* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-83* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-84* provides an overview of each diagnostic category.

Diagnostic Fault Information

Cause
Transmission Abuse: • Vehicle overloaded • Vehicle is towing beyond capacity • Vehicle modifications
Vehicle Damage: • Transmission oil cooler pipe kinked, pinched or restricted • Restricted air flow
Transmission Fluid: • Fluid leaks • Low fluid level • Contaminated or poor transmission fluid quality
Low Fluid Pump Output: • Low fluid level • Blocked, damaged or loose filter • Pinched or restricted cooler lines • Restricted cooler – damage or debris • Inefficient pump – worn

Circuit/System Description

The primary source of heat in the 1ET35 transmission is the drive motor. The drive motor is cooled by the transmission fluid. Hot fluid exits the drive motor and flows to the transmission oil cooler through the transmission cooler supply line and thermal bypass valve. The thermal bypass valve assembly is located on the upper left side of the transmission. The cooled fluid returns to the transmission through the transmission fluid cooler pipe assembly and cools the drive motor. The transmission fluid temperature sensor

is located in the A/Trans Control Wiring Harness Assembly. The Transmission Fluid Temperature parameter on the scan tool should rise steadily to a normal operating temperature, and then stabilize.

The thermal bypass valve is mechanically operated, based on the oil temperature of the transmission in order to maintain optimum transmission operating efficiency. The valve has an activating temperature of 82°C (176°F), with the range to move being 78–83°C (172–181°F). The full open temperature is 96°C (205°F). The thermal bypass valve assembly begins to open at 82°C (176°F) for optimum transmission operation and efficiency. The valve has a typical oil flow rate of 9–10 lpm (2.4–2.6 gpm).

Cold Mode:

82°C (176°F) and below the thermal bypass valve bypasses the oil going to the cooler and sends the fluid back to the transmission.

Mixing Mode:

82–96°C (176–205°F) the thermal bypass valve is in mixing mode – some of the fluid flows back to the trans and some flows through the transmission oil cooler.

Hot Mode:

Above 96°C (205°F) the thermal bypass valve is fully open and transmission oil flows through the cooler then back to the transmission.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 16-7

Description and Operation

- *Transmission General Description on page 16-92*
- *Transmission Indicators and Messages on page 16-93*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

- *DT-24731* Tempil Stick
- *DT-45096* Transmission Oil Cooler System Flush and Flow Test Tool

For equivalent regional tools, refer to *Special Tools on page 16-96*.

Component Testing

1. Perform the *Fluid Leak Diagnosis on page 16-30*.
2. Verify airflow through the radiator is not obstructed.
3. Perform the *Transmission Fluid Level and Condition Check on page 16-28* procedure.
4. Perform the *Transmission Fluid Cooler Flushing and Flow Test on page 16-106*.
5. With a hand held or infra red thermometer or *DT-24731* tempil stick, test for the transmission cooler supply line thermal bypass valve assembly opening at 96°C (205°F). The transmission cooler supply line temperature should be higher on the transmission side of the thermal bypass valve assembly than the cooler side until 96°C (205°F) is reached.

⇒ **If the thermal bypass valve tests stuck closed**

Replace the thermal bypass valve assembly.

⇒ **If the thermal bypass valve tests normal**

Inspect the transmission oil passages for a blockage.

⇒ **If passages are blocked**

Repair as necessary.

⇓ **If passages are not blocked**

6. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-123* after completing the repair.

- *Transmission Fluid Auxiliary Cooler Replacement on page 16-112*
- *Transmission Cooler Bypass Valve Replacement on page 16-113*
- *Transmission Fluid Cooler Inlet Pipe Replacement on page 16-119*
- *Transmission Fluid Cooler Outlet Pipe Replacement on page 16-120*

Transmission Fluid Cooler Flushing and Flow Test

GM studies indicate that plugged or restricted transmission oil coolers and pipes cause insufficient transmission lubrication and elevated operating temperatures which can lead to premature transmission failure. Many repeat repair cases could have been prevented by following published procedures for transmission oil cooler flushing and flow checking. This procedure includes flow checking and flushing the auxiliary transmission oil cooler, if equipped.

Note: Use the *DT-45096* transmission oil cooling system flush and flow test tool or equivalent to flush and flow test the transmission oil cooler and the oil cooler pipes after the transmission is removed for repairs.

Only use the appropriate GM automatic transmission fluid when doing a repair on a GM transmission.

If the fluid in the *DT-45096* transmission oil cooling system flush and flow test tool is different than what is used in the transmission, use compressed air to blow the residual transmission fluid out of the oil cooler and lines.

Time allowance for performing the cooler flow checking and flushing procedure has been included in the appropriate labor time guide operations since the 1987 model year. The service procedure steps for oil cooler flushing and flow testing are as follows:

Cooler Flow Check and Flushing Steps

1. Machine Set-up
2. Determine Minimum Flow Rate
3. Back Flush
4. Forward Flush

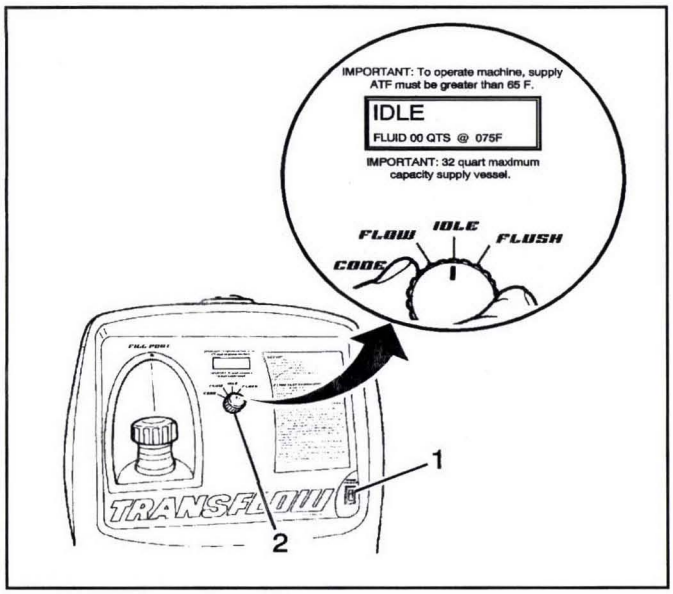
5. Flow Test
6. Code Recording Procedure
7. Clean-up

Special Tools

- *DT-45096* Transmission Oil Cooling System Flush and Flow Test Tool
- *DT-45096-23* TransFlow Adapters or equivalent.
- Shop air supply with water/oil filters, regulator and pressure gauge — minimum 90 psi
- Eye protection
- Rubber gloves

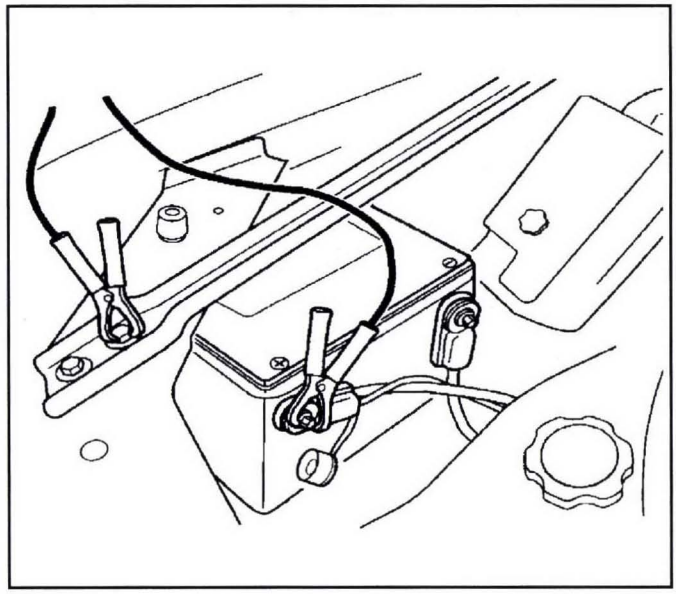
For equivalent regional tools, refer to *Special Tools on page 16-121*.

Machine Set-up



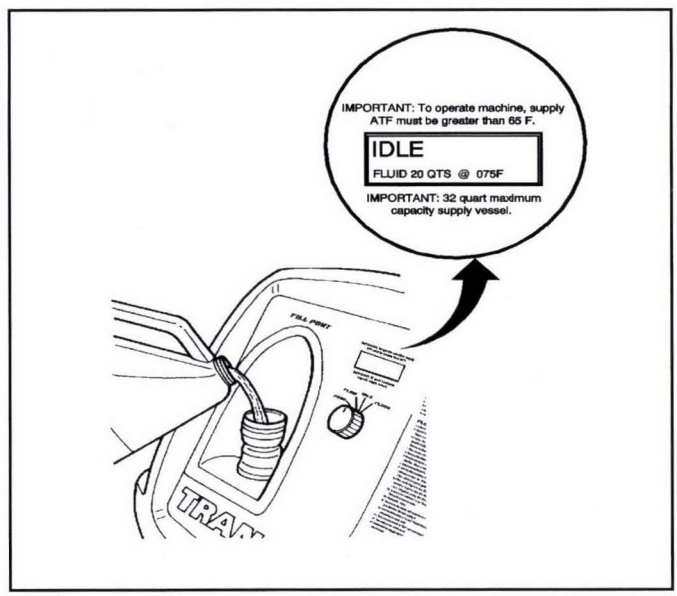
1212328

1. Verify that the main power switch (1) is in the OFF position.
2. Place the main function switch (2) in the IDLE position.



1212329

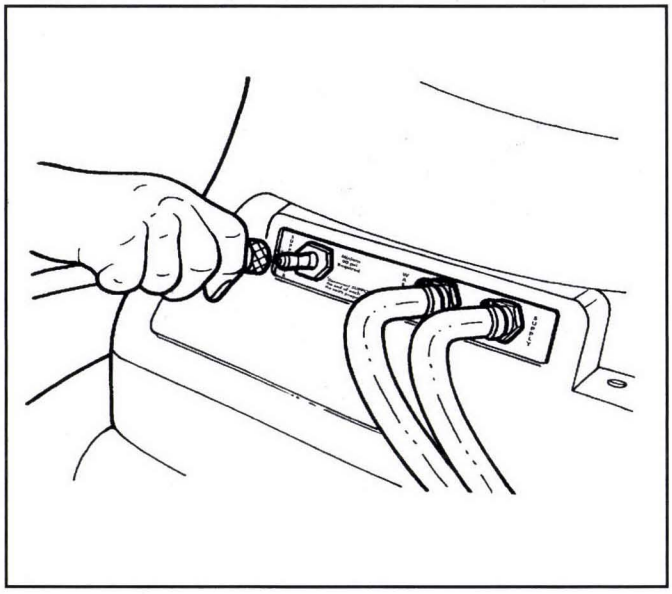
3. Connect *DT-45096* flush and flow test tool to the vehicle 12V DC power source by connecting the red battery clip to the positive, +, battery post on the vehicle and connect the negative lead to a known good chassis ground.
4. Turn the main power switch to the ON position.



1212332

Caution: Do not overfill the supply vessel. Damage to the unit may result. To verify the fluid level, view the LCD screen display while filling the unit, to ensure the fluid level does not exceed 30 L (32 qt).

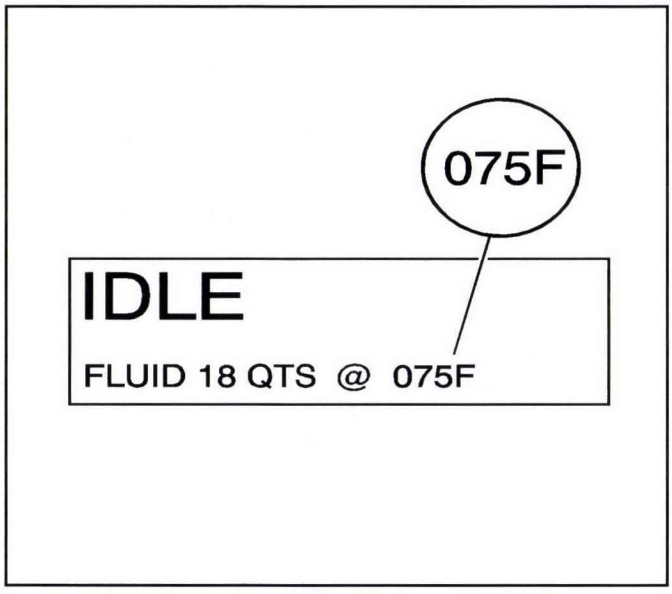
5. Fill the supply tank with the appropriate GM automatic transmission fluid through the fill port.
6. Reinstall and tighten the fill cap.



1212333

7. Connect a shop air supply hose to the quick-disconnect on the rear panel marked SUPPLY AIR.

Determine Minimum Flow Rate



1212334

Note: Due to the large size of the oil cooling system components and the flow capacity of the *DT-45096* flush and flow test tool, the fluid temperature in excess of 100 degrees Fahrenheit can cause inaccurate flow readings.

1. From the machine display, identify the temperature of the automatic transmission fluid that is stored in the supply vessel of *DT-45096* flush and flow test tool.
2. Refer to the table below. Using the temperature from step 1, locate on MINIMUM Flow Rate table the minimum flow rate in gallons per minute. Record the minimum flow rate in gallons per minute and the supply fluid temperature for further reference.

Example

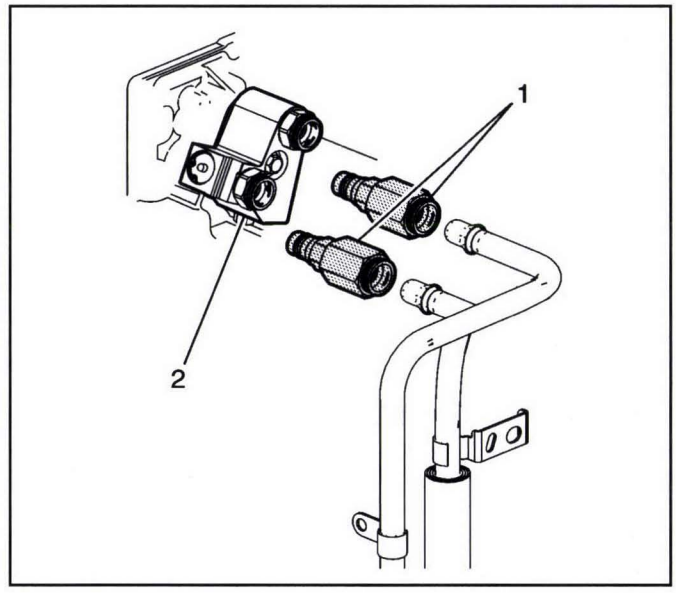
- Fluid temperature: 75°F
- The MINIMUM flow rate for this example would be 1.7 gpm.

3. Inspect transmission oil cooler lines for damage or kinks that could cause restricted oil flow. Repair as needed and refer to the appropriate GM service manual procedures.

Minimum Flow Rate in Gallons Per Minute

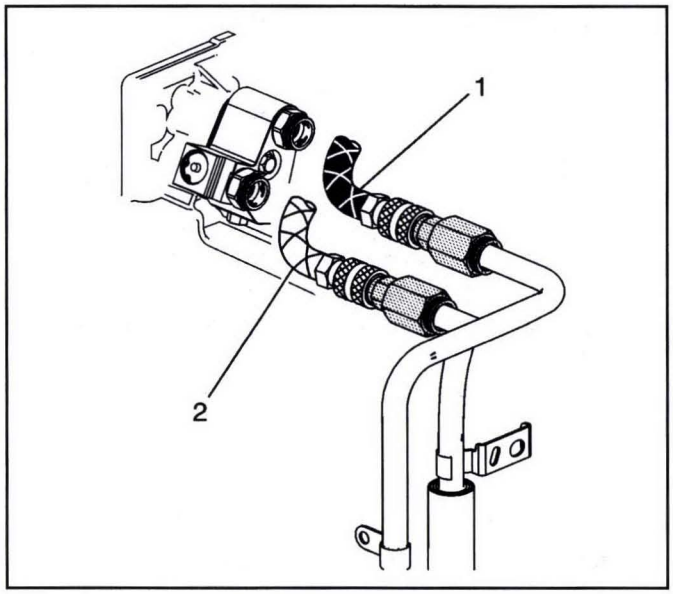
Temperature Range	Steel
65 – 66°F	1.4 Gallons Per Minute
67 – 71°F	1.5 Gallons Per Minute
72 – 74°F	1.6 Gallons Per Minute
75 – 82°F	1.7 Gallons Per Minute
83 – 91°F	1.8 Gallons Per Minute
92 – 96°F	1.9 Gallons Per Minute
97 – 104°F	2.1 Gallons Per Minute
105 – 113°F	2.2 Gallons Per Minute

Back Flush Procedure



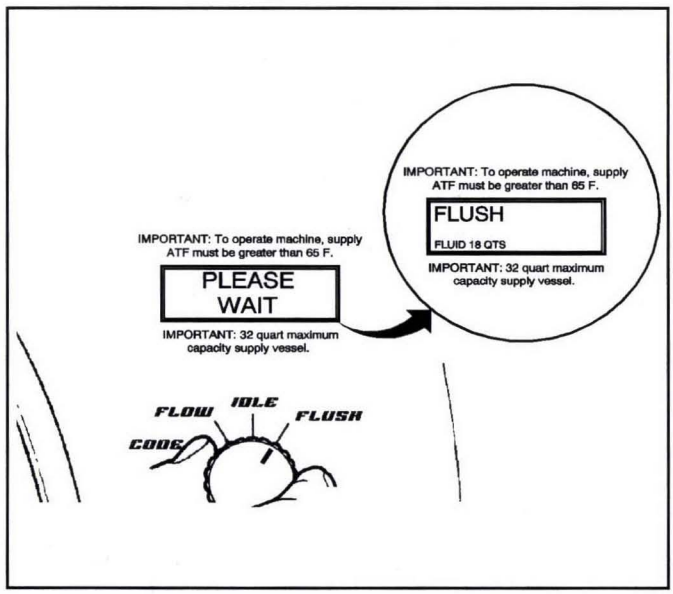
3553832

1. Connect the *DT-45096-23* adapters (1) to the transmission fluid cooler supply and return lines at the transmission fluid cooler bypass valve (2), if equipped.



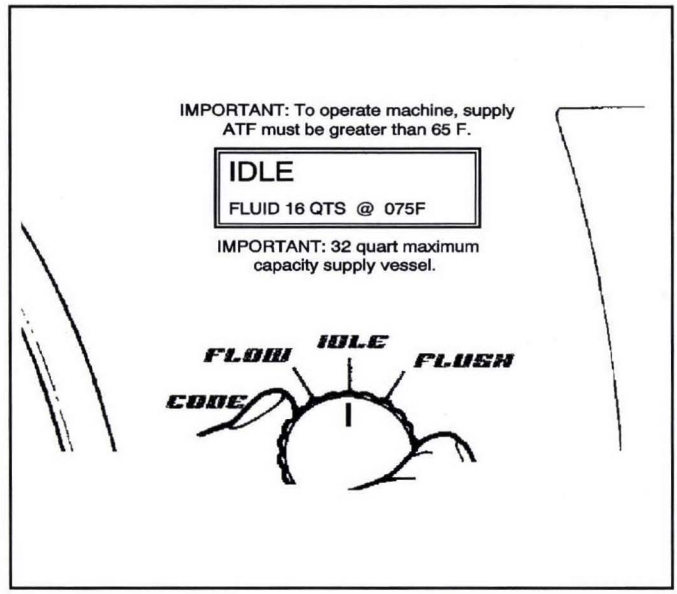
3553834

2. Connect the black supply hose (1) to the return line, top connector of the transmission, and the clear waste hose (2) to the supply line, bottom connector of the transmission, to the vehicle cooler lines. This is the reverse flow - backflush direction.



1212339

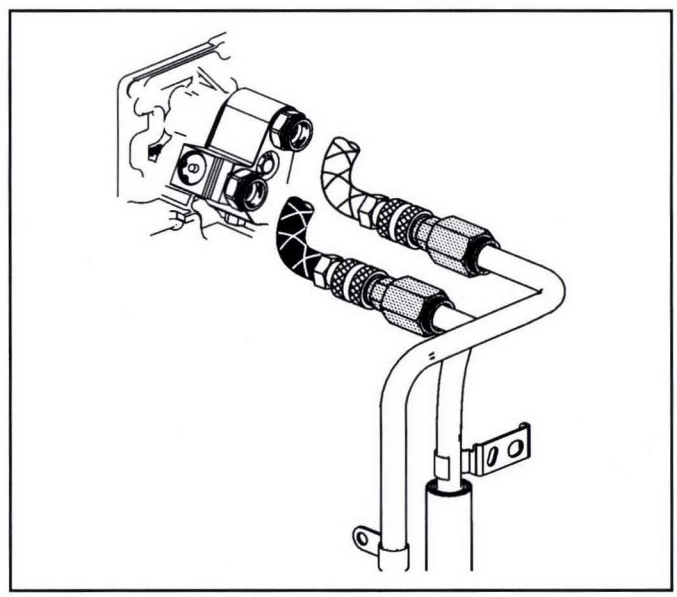
3. Turn the main function switch to the FLUSH position. Allow the machine to operate for 30 seconds.



1212341

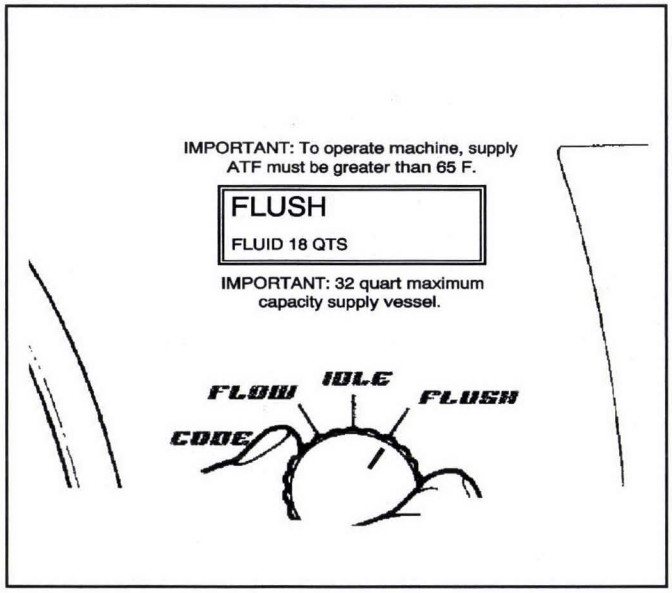
4. Turn the main function switch to the IDLE position and allow the supply vessel pressure to dissipate.

Forward Flush



3553835

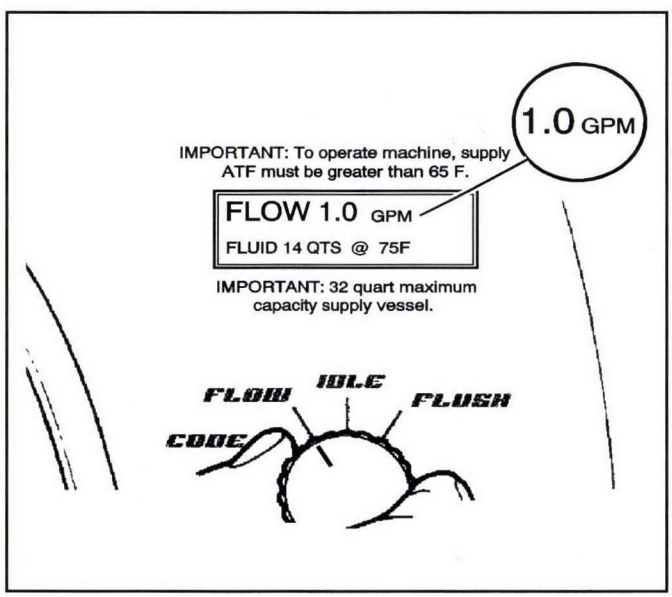
1. Disconnect the supply and waste hoses from the vehicle cooler lines. Reverse the supply and waste hoses to provide a normal flow direction.



1212343

2. Turn the main function switch to the FLUSH position and allow machine to operate for 30 seconds.

Flow Test

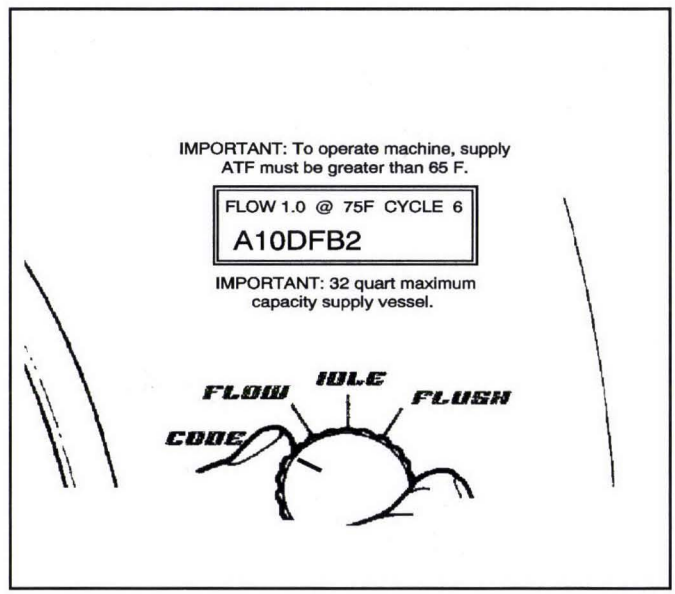


1212345

Note: If the flow rate is less than 0.5 gallons per minute, the LCD displays an error message. Refer to the Troubleshooting section of the operation manual.

1. Turn the main function switch to the FLOW position and allow the oil to flow for 15 seconds. Observe and note the flow rate; this is the TESTED flow rate.
2. Compare the TESTED flow rate to the MINIMUM flow rate information previously recorded.
   - If the TESTED flow rate is equal to or greater than the MINIMUM flow rate recorded, the oil cooling system is functioning properly. Perform Code Recording Procedure.
   - If the TESTED flow rate is less than the MINIMUM flow rate previously recorded, repeat the back flush and forward flush procedures.
3. If the TESTED flow rate is less than the MINIMUM flow rate after the second test, perform Code Recording Procedure.
   3.1. Replace the transmission oil cooler.
   3.2. Reconnect supply and waste hoses to the cooler lines in the normal flow direction. Perform Flow Test.
   3.3. Perform Code Recording Procedure.

Code Recording Procedure



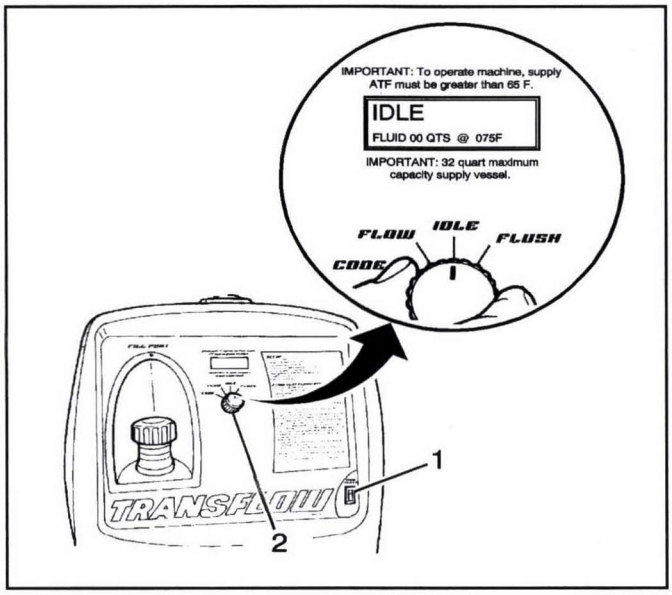
1212346

1. Turn the main function switch to the CODE position.

   Note:

   - If power is interrupted prior to the recording of the seven-character code, the code will be lost and the flow rate test will need to be repeated.
   - The flow test must run for a minimum of 8–10 seconds and be above 0.5 gallons per minute for a code to be generated.
2. Record TESTED flow rate, temperature, cycle and seven-character flow code information on repair order.

Clean-up

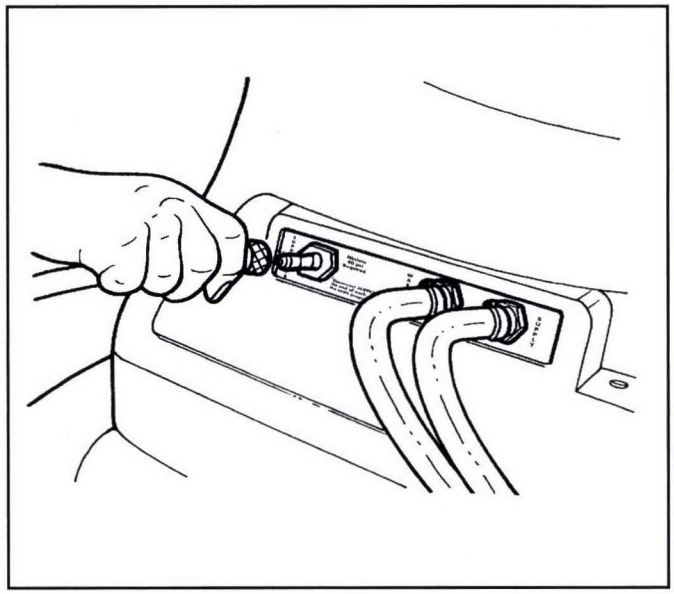


1212328

1. Turn the main function switch (2) to the IDLE position and allow the supply vessel pressure to dissipate.
2. Turn the main power switch (1) to the OFF position.

   Note:

   - A small amount of water may drain from the bottom of the unit when the air supply is disconnected. This is a normal operation of the built-in water separator.
   - If the fluid in the *DT-45096* transmission oil cooling system flush and flow test tool is different than what is used in the transmission, use compressed air to blow the residual transmission fluid out of the oil cooler and lines.
3. Disconnect the supply and waste hoses and the 12-volt power source from the vehicle.

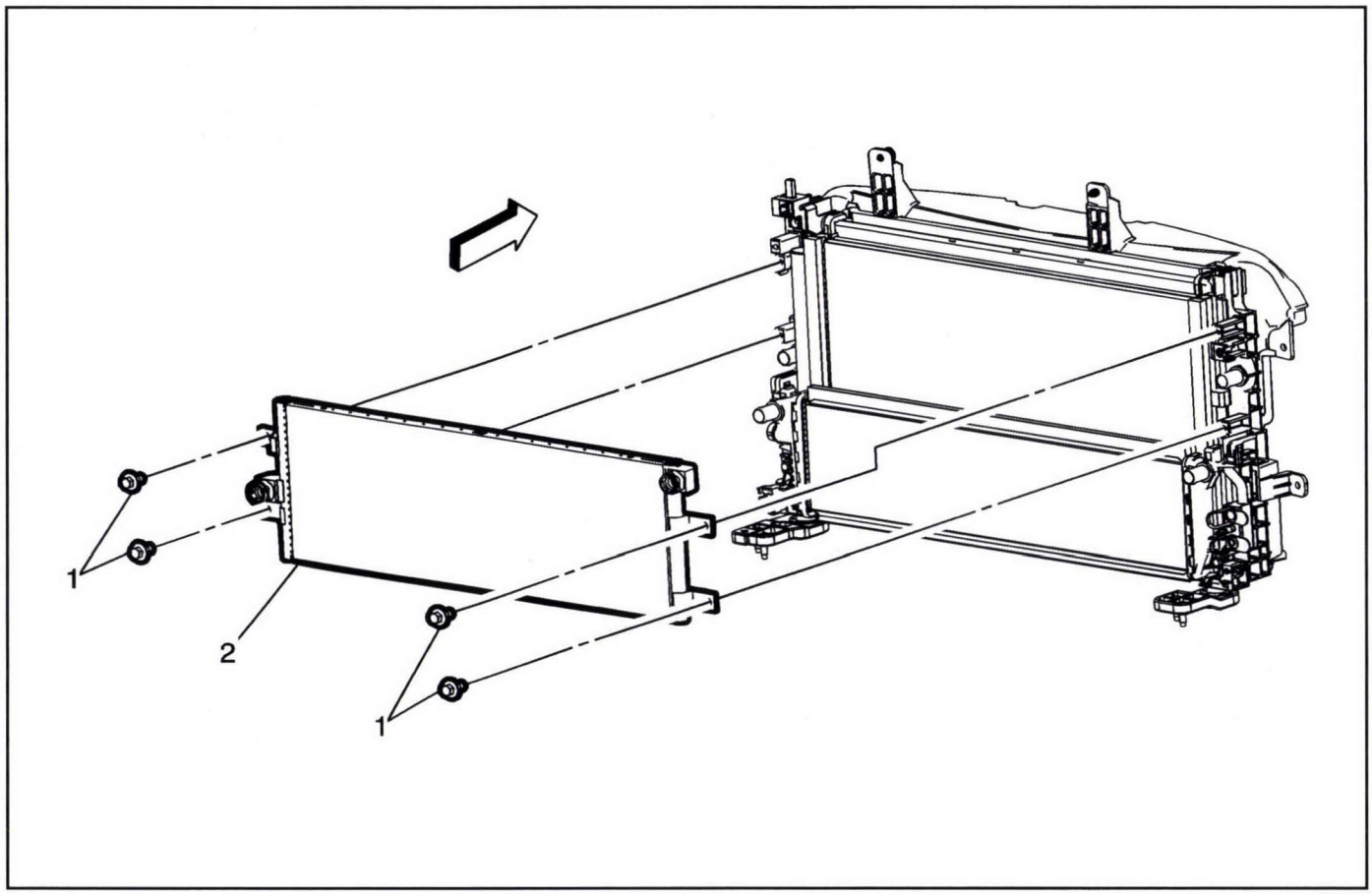


1212333

4. Disconnect the air supply hose from *DT-45096* flush and flow test tool.
5. Remove the *DT-45096-23* adapters.
6. Dispose of the waste automatic transmission fluid in accordance with all applicable federal, state, and local requirements.

Repair Instructions

Transmission Fluid Auxiliary Cooler Replacement



3227395

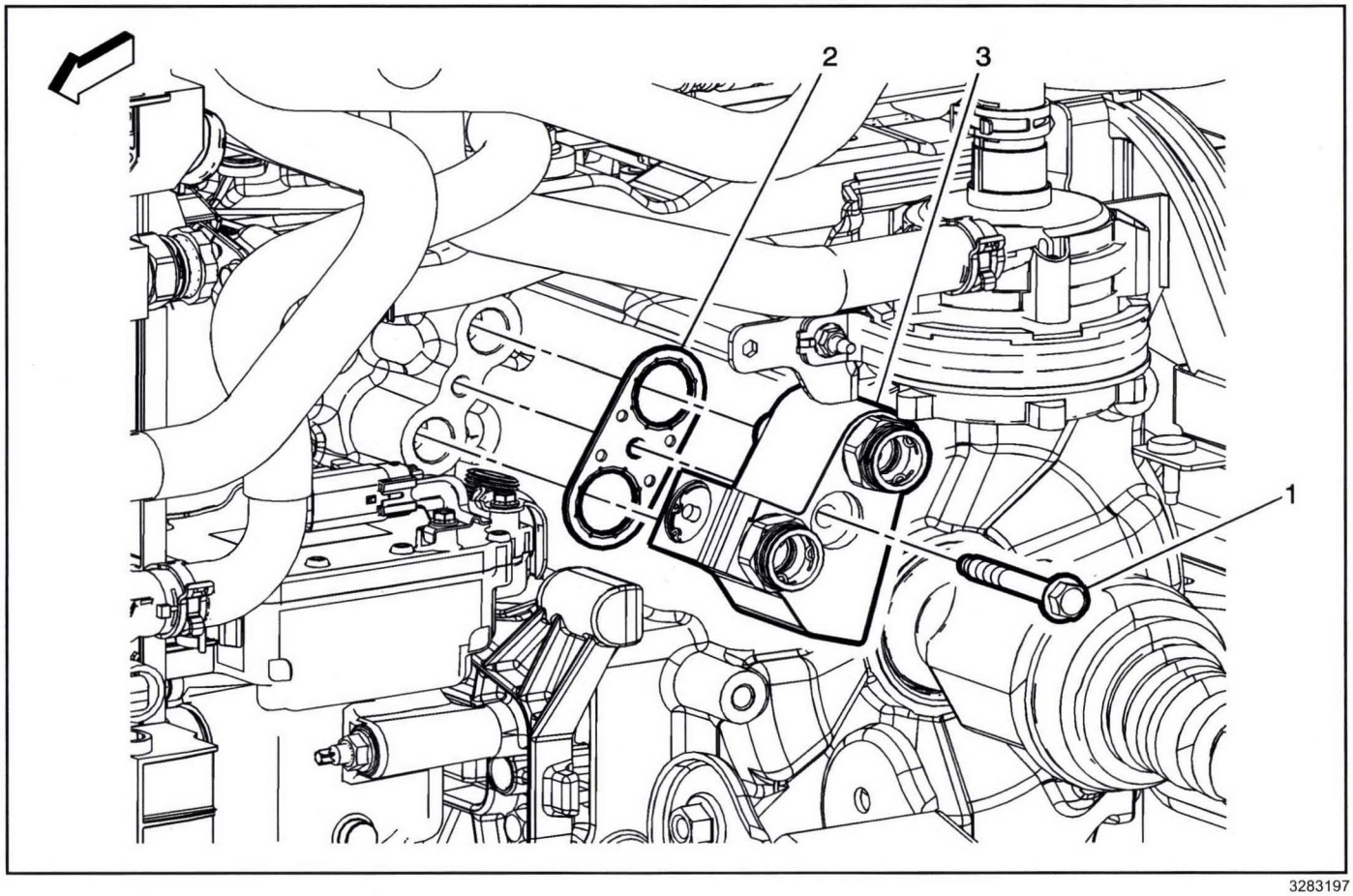
Transmission Fluid Auxiliary Cooler Replacement

Callout	Component Name
Danger: Before conducting any repair to this high voltage cooling system, it is necessary to determine/verify whether no high-voltage system faults exist. If high-voltage faults exist, follow published DTC diagnostics/repair procedures prior to performing any cooling system repairs. Failure to correct High Voltage Faults before working on the high voltage cooling system could result in personal injury or death.	
Preliminary Procedure 1. Turn Vehicle Power Off and remove all keyless entry transmitters from the vehicle and secure in a place outside the vehicle. 2. Disconnect the negative battery cable. Refer to *Battery Negative Cable Disconnection and Connection on page 9-20*. 3. Remove the front compartment front sight shield. Refer to *Front Compartment Front Sight Shield Replacement on page 3-39*. 4. Remove the front bumper impact bar. Refer to *Front Bumper Impact Bar Replacement on page 3-55*. 5. Remove the radiator air upper baffle and deflector. Refer to *Radiator Air Upper Baffle and Deflector Replacement (Air Baffle Upper) on page 9-302* or *Radiator Air Upper Baffle and Deflector Replacement (On Top of Radiator) on page 9-303*. 6. Remove the engine coolant fan and shroud bolts. Refer to *Cooling Fan and Shroud Replacement on page 9-283*. 7. Remove the transmission fluid cooler inlet and outlet pipes. Refer to *Transmission Fluid Cooler Inlet Pipe Replacement on page 16-119* and *Transmission Fluid Cooler Outlet Pipe Replacement on page 16-120*.	
1	Transmission Fluid Auxiliary Cooler Bolt (Qty: 4) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 6 N•m (53 lb in)

Transmission Fluid Auxiliary Cooler Replacement (cont'd)

Callout	Component Name
2	Transmission Fluid Auxiliary Cooler **Procedure** 1. Fill the transmission to the proper fluid level. 2. Inspect for transmission fluid leaks.

Transmission Cooler Bypass Valve Replacement



3283197

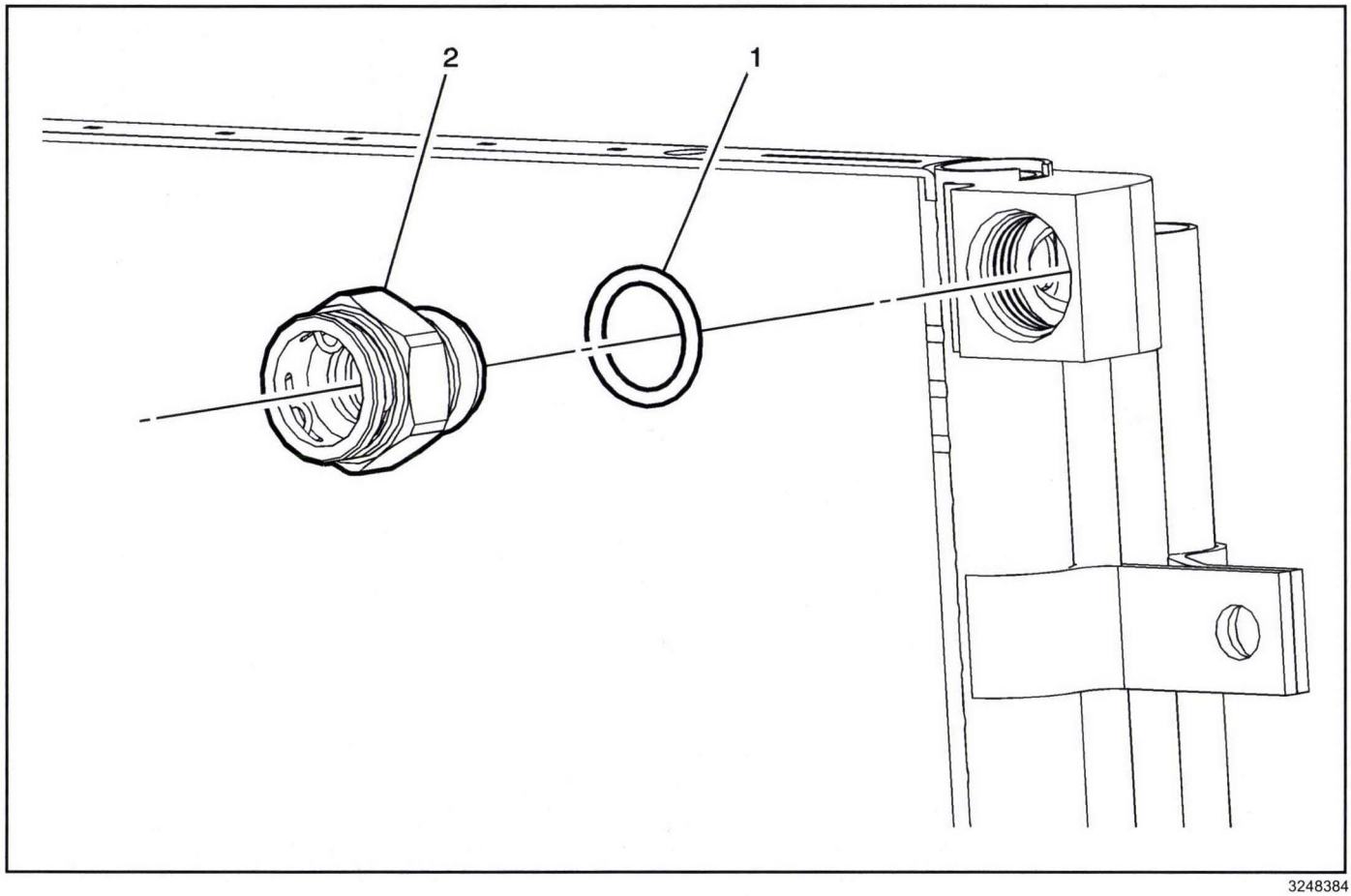
Transmission Cooler Bypass Valve Replacement

Callout	Component Name
	Danger: Before conducting any repair to this high voltage cooling system, it is necessary to determine/verify whether no high-voltage system faults exist. If high-voltage faults exist, follow published DTC diagnostics/repair procedures prior to performing any cooling system repairs. Failure to correct High Voltage Faults before working on the high voltage cooling system could result in personal injury or death.
	Preliminary Procedures 1. Turn Vehicle Power Off and remove all keyless entry transmitters from the vehicle and secure in a place outside the vehicle. 2. Remove the air conditioning compressor bracket. Refer to *Air Conditioning Compressor Bracket Replacement on page 10-27*. 3. Remove the transmission fluid cooler inlet pipe from the transmission fluid cooler bypass valve. Refer to *Transmission Fluid Cooler Inlet Pipe Replacement on page 16-119*. 4. Remove the transmission fluid cooler outlet pipe from the transmission fluid cooler bypass valve. Refer to *Transmission Fluid Cooler Outlet Pipe Replacement on page 16-120*. 5. Cap the fittings and plug the pipes when removing the transmission fluid cooler inlet pipe. 6. Place drain pan under the transmission fluid cooler inlet and outlet pipes.

Transmission Cooler Bypass Valve Replacement (cont'd)

Callout	Component Name
1	Transmission Fluid Cooler Bypass Valve Bolt **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 22 N•m (16 lb ft)
2	Transmission Fluid Cooler Bypass Valve Gasket
3	Transmission Fluid Cooler Bypass Valve **Procedures** 1. Adjust the transmission fluid level. 2. Inspect for fluid leaks.

Transmission Fluid Cooler Pipe Connector Replacement - Radiator



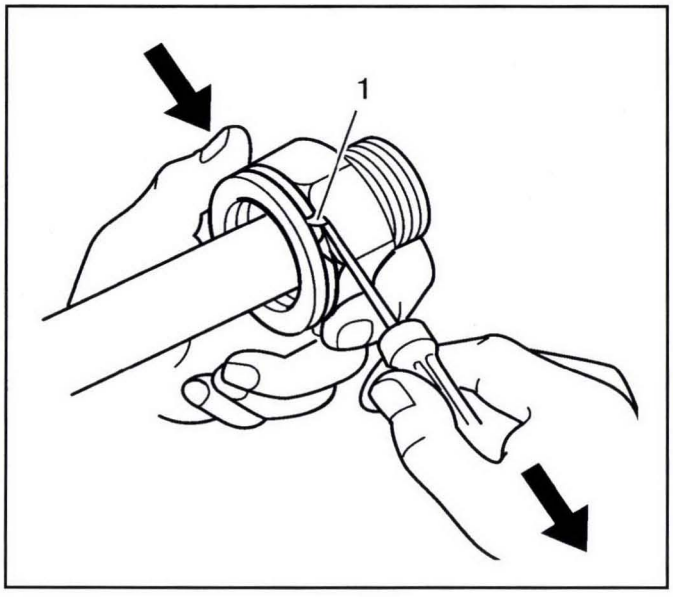
3248384

Transmission Fluid Cooler Pipe Connector Replacement - Radiator

Callout	Component Name
	Danger: Before conducting any repair to this high voltage cooling system, it is necessary to determine/verify whether no high-voltage system faults exist. If high-voltage faults exist, follow published DTC diagnostics/repair procedures prior to performing any cooling system repairs. Failure to correct High Voltage Faults before working on the high voltage cooling system could result in personal injury or death.
	Preliminary Procedure 1. Turn Vehicle Power Off and remove all keyless entry transmitters from the vehicle and secure in a place outside the vehicle. 2. Remove the transmission fluid cooler inlet or outlet pipe from transmission fluid cooler pipe connectors on the radiator. Refer to *Transmission Fluid Cooler Inlet Pipe Replacement on page 16-119* or *Transmission Fluid Cooler Outlet Pipe Replacement on page 16-120*. 3. Remove the cooling fan and shroud bolts from auxiliary fluid cooler and reposition out of the way the cooling fan and shroud. Refer to *Cooling Fan and Shroud Replacement on page 9-283*.
1	Transmission Fluid Cooler Pipe Connector O-ring **Procedure** Inspect the O-ring seals for cracks, cuts or damage. Replace and replace with a New O-ring if necessary.
2	Transmission Fluid Cooler Pipe Connector **Caution:** Refer to *Fastener Caution on page 0-8*. **Procedures** 1. Remove the plastic caps from the quick connect fittings by pulling the caps back along the pipe before installation. 2. Adjust the transmission fluid level. 3. Inspect for fluid leaks. **Note:** The correct thread engagement is critical. Cross-threaded fittings can achieve proper tightness and still leak. **Tighten** 38 N•m (28 lb ft)

Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection

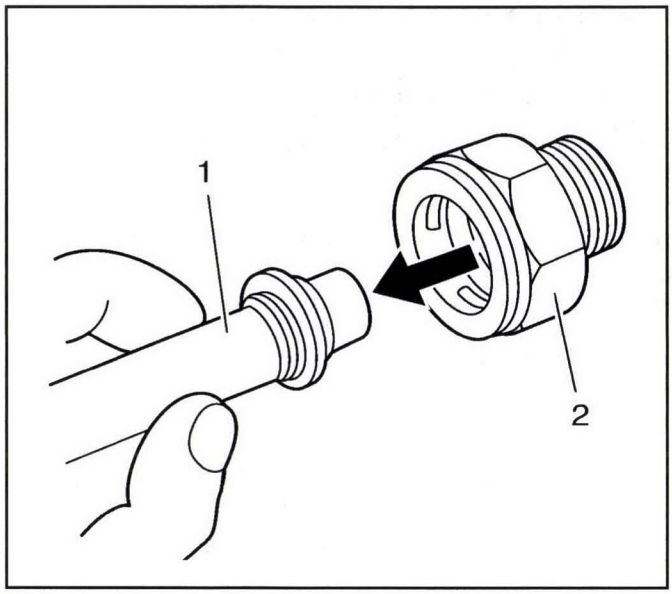
Removal Procedure



2027466

Note: Perform the following procedure when removing the retaining rings and cooler lines from the quick connect fittings located on the radiator and/or the transmission.

1. Pull the plastic cap back from the quick connect fitting and down along the cooler line about 5 cm (2 in).
2. Using a bent-tip screwdriver, pull on one of the open ends of the retaining ring (1) in order to rotate the retaining ring around the quick connect fitting until the retaining ring is out of position and can be completely removed.
3. Remove the retaining ring from the quick connect fitting.
4. Discard the retaining ring.



2027467

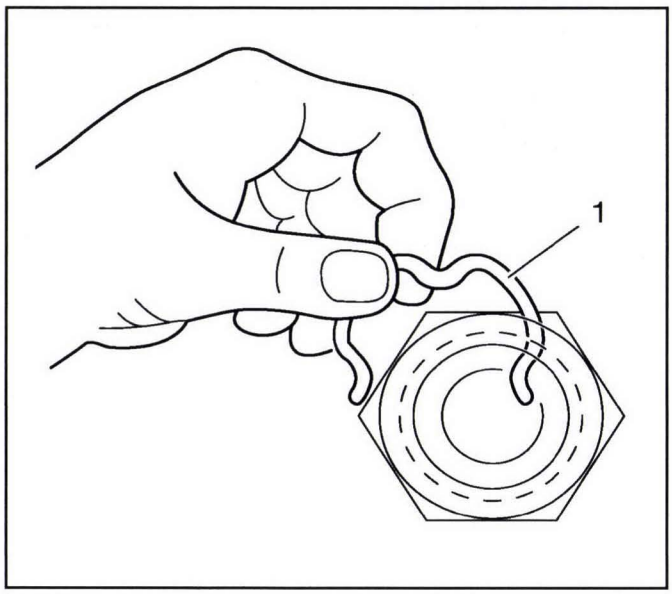
5. Pull the cooler line (1) straight out from the quick connect fitting (2).

Installation Procedure

Note:

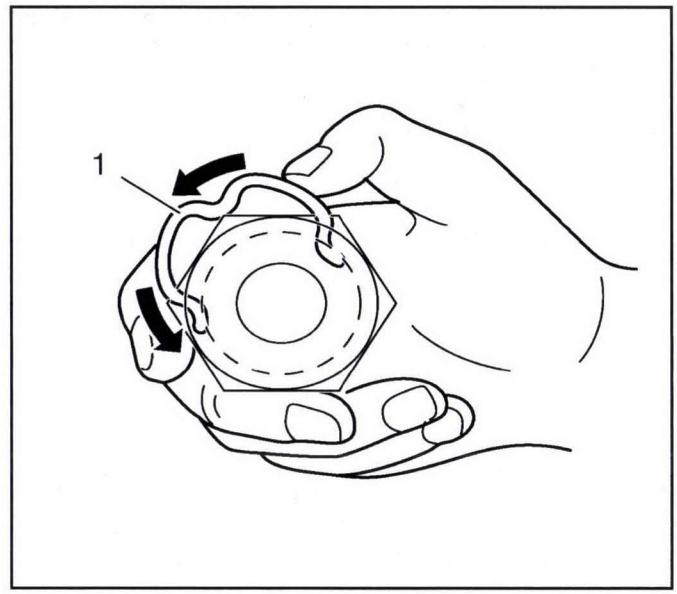
- Do not reuse any of the existing oil lines or oil line fittings if there is excessive corrosion.
- Do not reuse any of the existing retaining rings that were removed from the existing quick connect fittings. Install new retaining rings.
- Ensure the following procedures are performed when installing the new retaining rings onto the fittings.

1. Install a new retaining ring into the quick connect fitting using the following procedure:



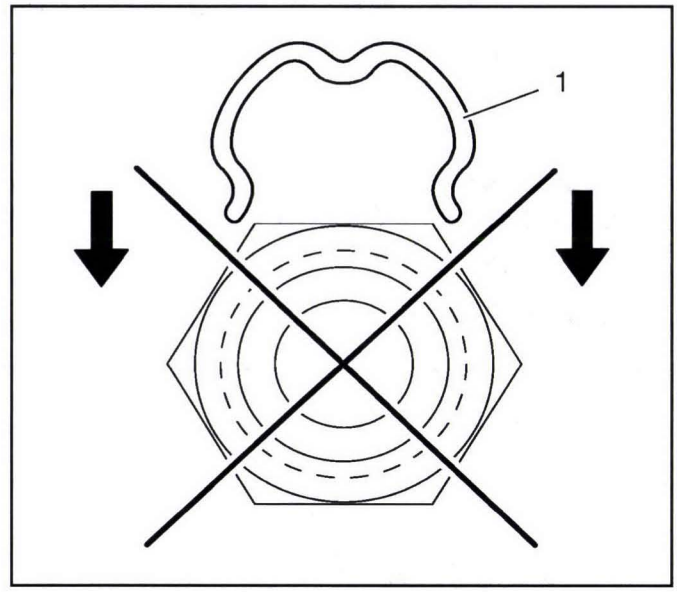
2027468

2. Hook one of the open ends of the retaining ring (1) in one of the slots in the quick connect fitting.



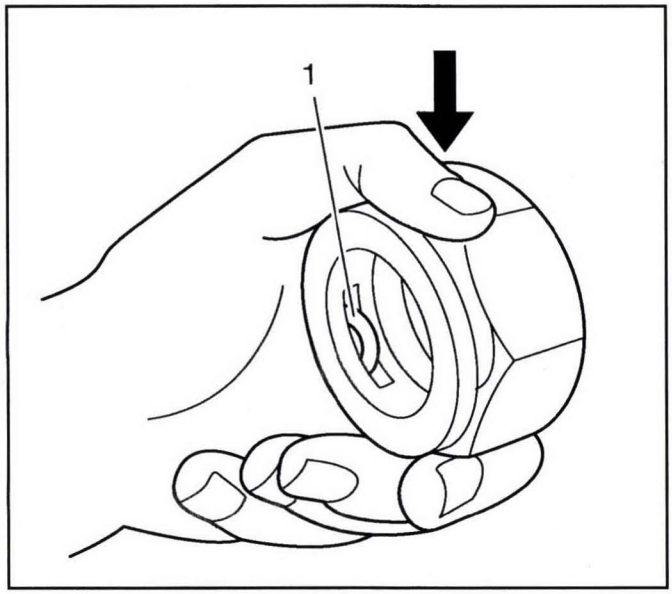
2027469

3. Rotate the retaining ring (1) around the fitting until the retaining ring is positioned with all three ears through the three slots on the fitting.



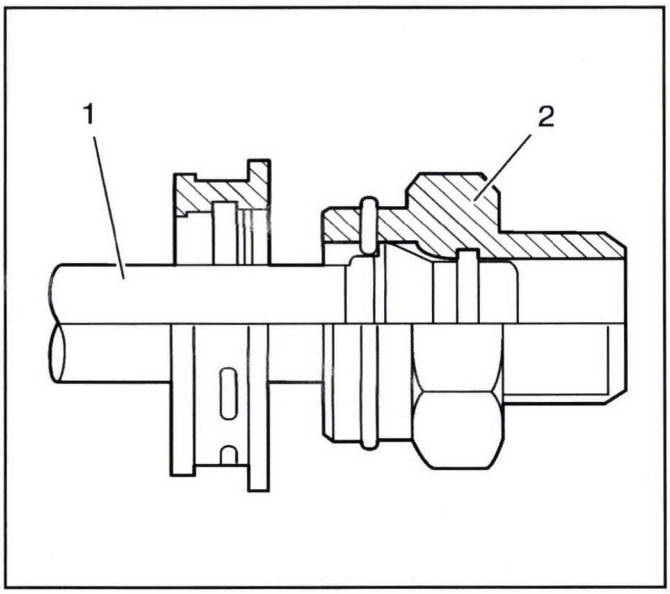
2027470

4. Do not install the new retaining ring (1) onto the fitting by pushing the retaining ring.



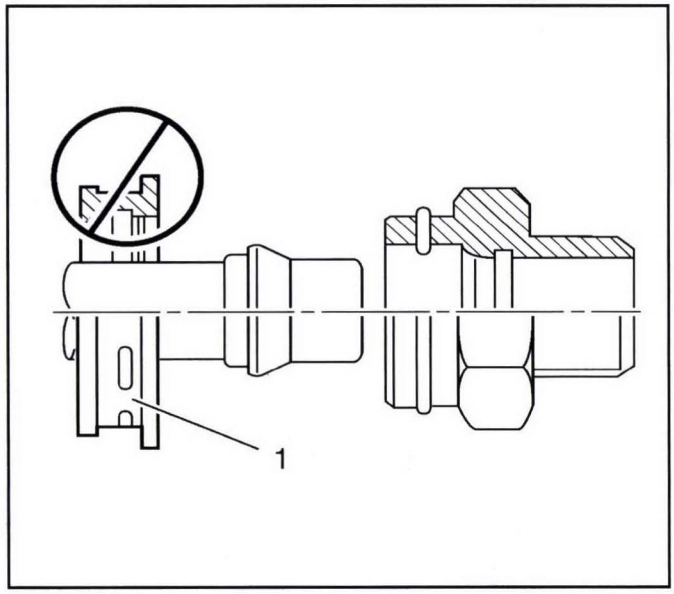
2027473

5. Ensure that the three retaining ring ears are seen from inside the fitting (1) and that the retaining ring moves freely in the fitting slots.



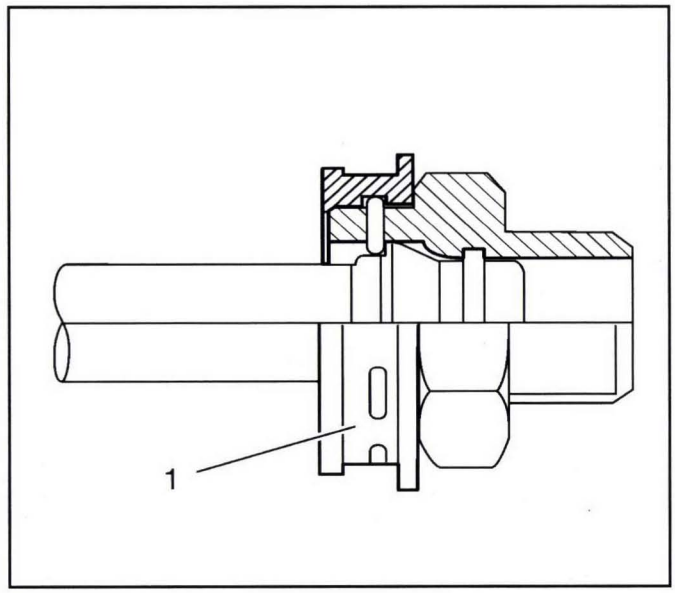
2027475

6. Install the cooler line (1) into the quick connect fitting (2).
7. Insert the cooler line end into the quick connect fitting until a click is either heard or felt.



2027476

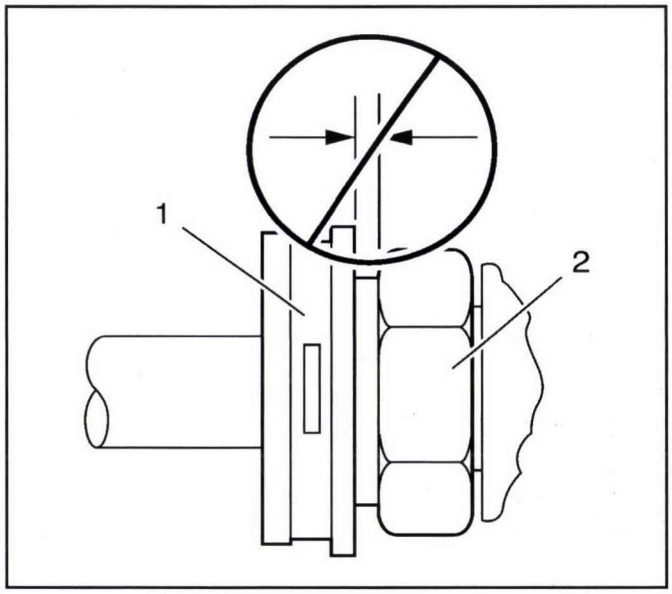
8. Do not use the plastic cap (1) on the cooler line in order to install the cooler line into the fitting.
9. Pull back sharply on the cooler line in order to ensure that the cooler line is fastened into the quick connect fitting.



2027482

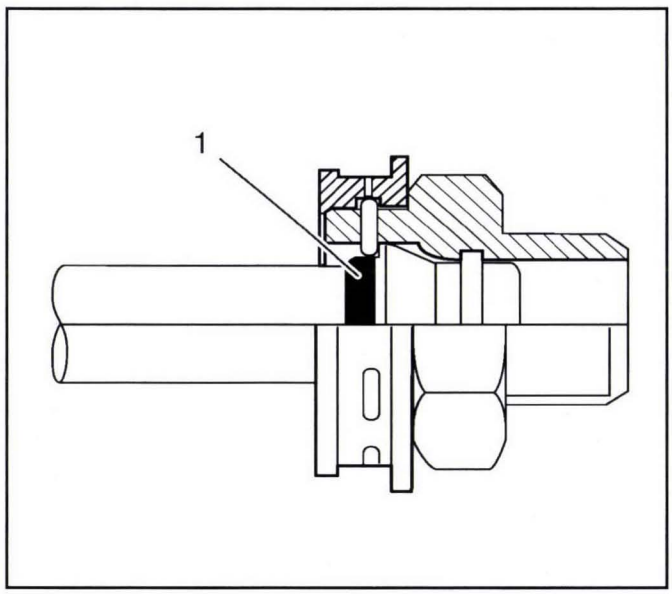
Note: Do not manually depress the retaining clip when installing the plastic cap.

10. Position (snap) the plastic cap (1) onto the fitting. Do not manually depress the retaining ring when installing the plastic cap onto the quick connect fitting.
11. Ensure that the plastic cap is fully seated against the fitting.



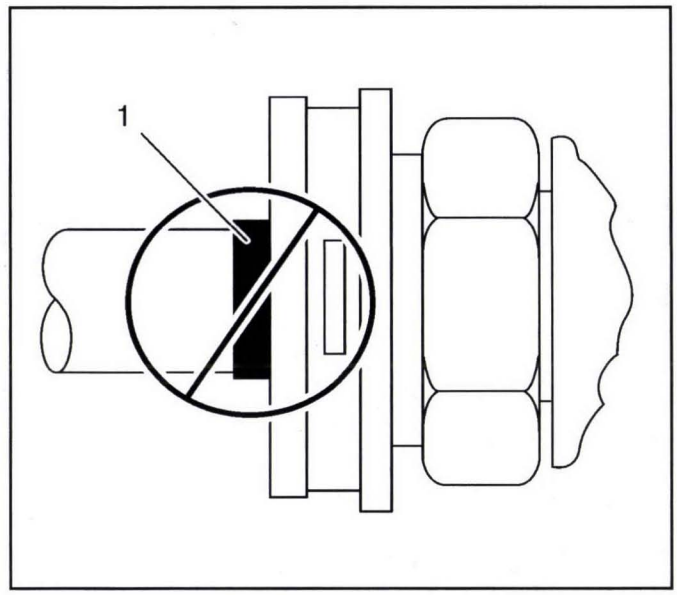
2027484

12. Ensure that no gap is present between the plastic cap (1) and the fitting (2).



2027485

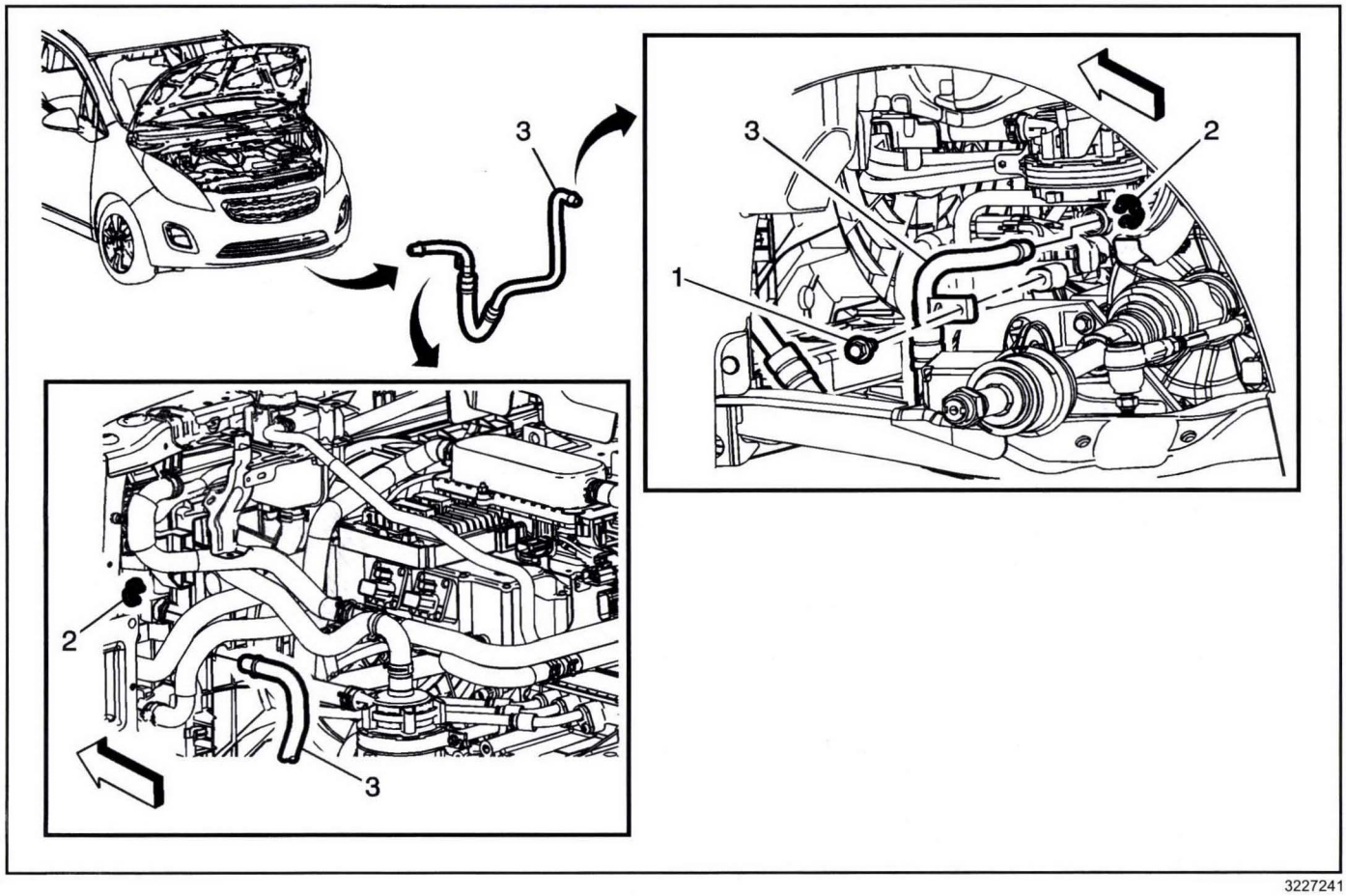
13. Ensure that the yellow identification band (1) on the tube is hidden within the quick connect fitting.



2027486

14. A hidden yellow identification band (1) indicates proper joint seating.
15. Fill the transmission to the proper level. Refer to *Transmission Fluid Level and Condition Check on page 16-28*.

Transmission Fluid Cooler Inlet Pipe Replacement



3227241

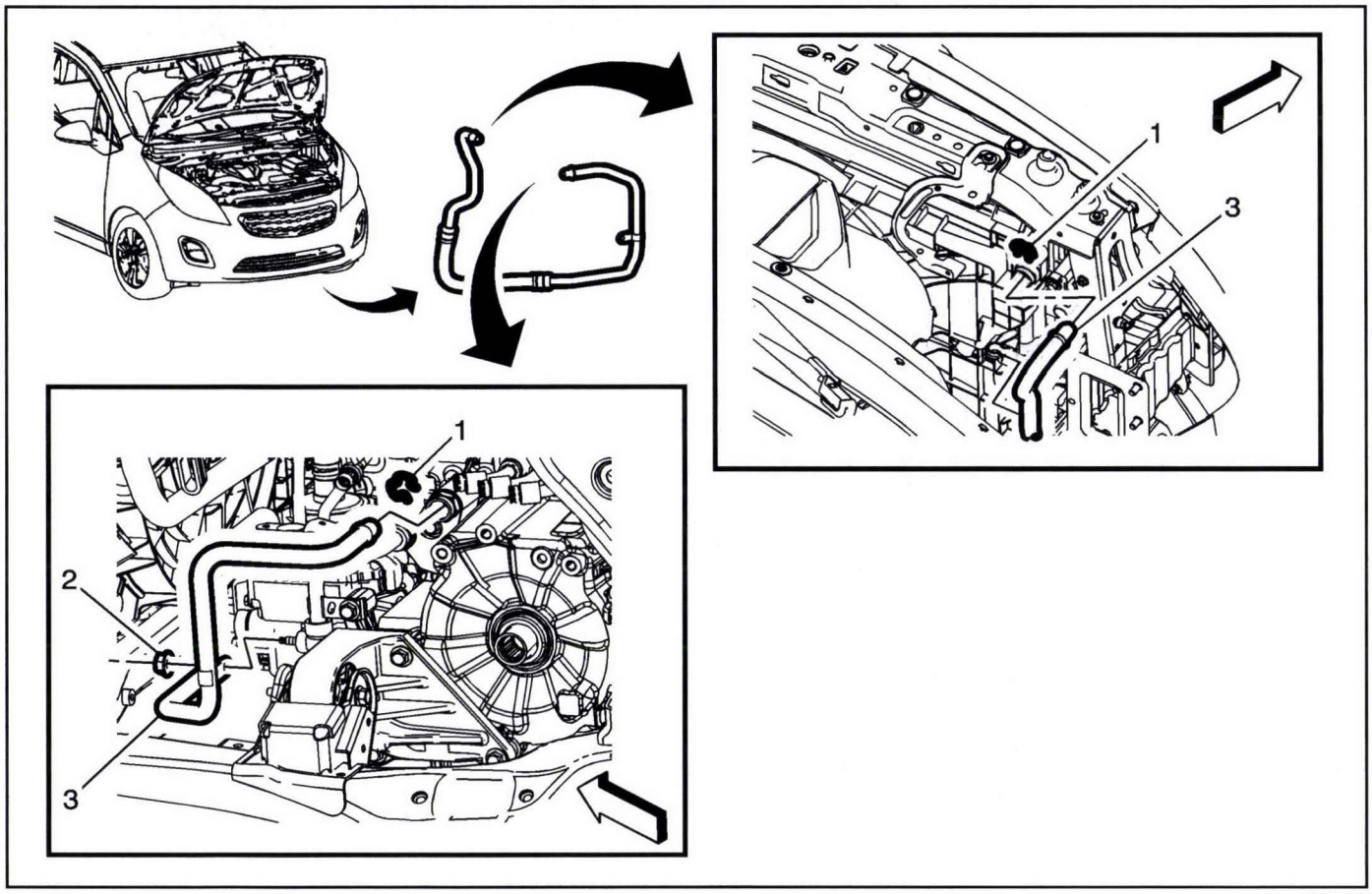
Transmission Fluid Cooler Inlet Pipe Replacement

Callout	Component Name
Danger: Before conducting any repair to this high voltage cooling system, it is necessary to determine/verify whether no high-voltage system faults exist. If high-voltage faults exist, follow published DTC diagnostics/repair procedures prior to performing any cooling system repairs. Failure to correct High Voltage Faults before working on the high voltage cooling system could result in personal injury or death.	
Preliminary Procedures 1. Turn Vehicle Power Off and remove all keyless entry transmitters from the vehicle and secure in a place outside the vehicle. 2. Remove the reservoir radiator surge tank. Refer to *Radiator Surge Tank Replacement (Reserve Energy Supply System Reservoir) on page 9-276* or *Radiator Surge Tank Replacement (Power Energy Reservoir) on page 9-277* or *Radiator Surge Tank Replacement (Heater Reservoir) on page 9-278*. 3. Remove the left front wheelhouse liner. Refer to *Front Wheelhouse Liner Replacement - Left Side on page 3-139*. 4. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*. 5. Remove the air conditioning compressor bracket. Refer to *Air Conditioning Compressor Bracket Replacement on page 10-27*. 6. Disconnect the cooling fan connector from cooling fan. 7. Cap the fittings and plug the pipes when removing the transmission fluid cooler inlet pipe. 8. Place drain pan under the transmission fluid cooler inlet pipe.	
1	Transmission Fluid Cooler Inlet Pipe Bolt **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 30 N•m (22 lb ft)
2	Transmission Fluid Cooler Inlet Pipe Retaining Clip (Qty: 2) **Procedure** Remove the transmission fluid cooler inlet pipe retaining clip. Refer to *Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection on page 16-115*.

Transmission Fluid Cooler Inlet Pipe Replacement (cont'd)

Callout	Component Name
3	Transmission Fluid Cooler Inlet Pipe **Procedures** 1. Adjust the transmission fluid level. 2. Inspect for fluid leaks.

Transmission Fluid Cooler Outlet Pipe Replacement



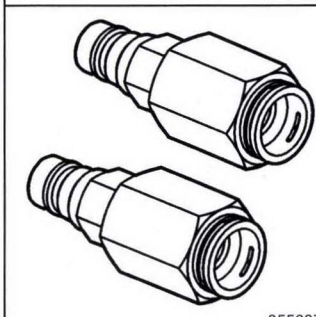
3227257

Transmission Fluid Cooler Outlet Pipe Replacement

Callout	Component Name
Danger: Before conducting any repair to this high voltage cooling system, it is necessary to determine/verify whether no high-voltage system faults exist. If high-voltage faults exist, follow published DTC diagnostics/repair procedures prior to performing any cooling system repairs. Failure to correct High Voltage Faults before working on the high voltage cooling system could result in personal injury or death. **Preliminary Procedures** 1. Turn Vehicle Power Off and remove all keyless entry transmitters from the vehicle and secure in a place outside the vehicle. 2. Remove the RESS radiator surge tank. Refer to *Radiator Surge Tank Replacement (Reserve Energy Supply System Reservoir) on page 9-276* or *Radiator Surge Tank Replacement (Power Energy Reservoir) on page 9-277* or *Radiator Surge Tank Replacement (Heater Reservoir) on page 9-278*. 3. Remove the left front wheelhouse liner . Refer to *Front Wheelhouse Liner Replacement - Left Side on page 3-139*. 4. Remove the front compartment air deflector. Refer to *Front Compartment Air Deflector Replacement on page 3-125*. 5. Remove the air conditioning compressor bracket. Refer to *Air Conditioning Compressor Bracket Replacement on page 10-27*. 6. Disconnect the transmission fluid cooler inlet pipe from the transmission cooler bypass valve. Refer to *Transmission Fluid Cooler Inlet Pipe Replacement on page 16-119*. 7. Cap the fittings and plug the pipes when removing the transmission fluid cooler outlet pipe. 8. Place drain pan under the transmission fluid cooler outlet pipe.	
1	Transmission Fluid Cooler Outlet Pipe Retaining Clip (Qty: 2) **Procedure** Remove the transmission fluid cooler outlet pipe retaining clip. Refer to *Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection on page 16-115*.
2	Transmission Fluid Cooler Outlet Pipe Nut **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 23 N•m (17 lb ft)
3	Transmission Fluid Cooler Outlet Pipe **Procedures** 1. Adjust the transmission fluid level. 2. Inspect for fluid leaks.

Special Tools and Equipment

Illustration	Tool Number/ Description
 23570	DT 24731 J 24731 Temp Stick

Illustration	Tool Number/ Description
 1215917	DT 45096 J 45096 Transmission Oil Cooling System Flush and Flow Test Tool
 3556377	DT-45096-23 TransFlow Adapters

BLANK

3

300-Volt Battery Positive and Negative Cable
Replacement 9-454, 9-457

A

A/C Diagnostics Chart 10-8
ABS
Description and Operation 5-91
Accessory DC Power Control Module
Description and Operation 9-192
Programming and Setup 6-5
Replacement 9-189
Scan Tool Information 6-20
Accessory Power
Receptacle Retainer Replacement 11-248
Accessory Power Receptacle
Replacement 11-249
Acronyms and Units 1-4
Active Grille
Air Shutter Description and Operation 3-67
Air Shutter Malfunction 3-49, 3-51
Adhesives, Fluids, Lubricants,
and Sealers 2-18, 4-202, 5-96, 5-133, 10-4, 15-48, 16-5
AFL/EPC Connectors 11-898
Afterblow Enable Procedure 10-132
Air Conditioning
O-Ring Seal Replacement 10-30
Refrigerant Pressure Sensor Replacement - High Pressure 10-42
Refrigerant Pressure Sensor Replacement - Low Pressure 10-41
System Performance Test 10-5
Air Conditioning Compressor
Control Module Programming and Setup 6-5
Malfunction 10-131
Oil Diagnosis 10-11
Air Conditioning Compressor and Condenser Hose
Replacement 10-32
Air Conditioning Evaporator
Core Replacement 10-47
Hose Assembly Replacement 10-34
Module Drain Hose Replacement 10-49
Thermal Expansion Valve - Tube Replacement 10-37
Thermal Expansion Valve Replacement 10-40
Air Distributor
Case Replacement 10-62
Air Hose Test 1-85
Air Inlet
Assembly Replacement 10-58
Air Inlet Grille Panel
Replacement 4-327
Air Inlet Housing
Replacement 10-59
Air Inlet Valve
Actuator Replacement 10-136
Air Outlet
Duct Replacement - Floor, Left 10-71
Duct Replacement - Floor, RH 10-72
Air Pressure Test 1-30
Air Temperature
Actuator Replacement 10-139
Air/Wind Noise Diagnosis 1-30
Airbag
Indicator Malfunction 12-147, 12-149
Sensing and Diagnostic Module Replacement 12-155
Steering Wheel Module Coil Centering 12-158
Airbag Side Impact Sensor
Replacement - Center Pillar 12-166
Aluminum Wheel
Porosity Repair 15-50
Refinishing 15-51
Ambient Air Temperature
Gauge Sensor Replacement 8-92
Ambient Air Temperature Sensor
Resistance 8-76
Anti-Corrosion Treatment and Repair 3-141
Application Malfunction 8-28
Approximate Fluid Capacities
Automatic Transmission 16-5
Heating, Ventilation, and Air Conditioning 10-3
Hybrid/EV System Heating and Cooling 9-200
Hydraulic Brakes 5-133
Maintenance and Lubrication 1-32
Armrest Replacement
Front Seat 13-8
Arrows and Symbols 1-3
Assist Handle
Replacement 2-59
Audible Warnings Description and Operation 8-98
Automated Bleed Procedure 5-72
Automatic HVAC Description and Operation 10-144
Automatic Transmission
Fluid Leaks 16-30
Range Selector Lever Replacement 16-35
Automatic Transmission Auxiliary Fluid Pump
Control Module Scan Tool Information 6-21
Auxiliary Audio Input Malfunction 8-30
Auxiliary Battery
Wiring Harness
Replacement 9-530–9-532, 9-535
Auxiliary Heater
Inlet Hose Replacement 10-51
Auxiliary Heater Outlet Hose
Replacement 10-52
Auxiliary Radiator
Replacement 9-275

B

Backup Lamps
Malfunction 4-142
Basecoat/Clearcoat Paint Systems 3-141

Battery
Charge Indicator Replacement 8-97
Charging 9-16
Cover Seal Replacement 9-450
Current Sensor Replacement 9-20
Description and Operation 9-34
Electrical Drain/Parasitic Load Test 9-17
Inspection/Test 9-15
Replacement 9-28
Battery Cable
Replacement 9-515–9-517, 9-521
Battery Charger
Programming and Setup 6-5
Battery Energy Control Module
Programming and Setup 6-6
Replacement 9-451
Scan Tool Information 6-45
Battery Heater
Fuse Replacement 9-303
Replacement 9-306
Battery Negative Cable
Disconnect/Connect Procedure 9-20
Replacement 9-22
Battery Positive Cable
Replacement 9-24
Battery Tray
Replacement 9-30, 9-522
Blower Motor
Replacement 10-61
Blower Motor Control
Replacement 10-60
Bluetooth
Malfunction 8-33
Body Control Module
Bracket Replacement 11-235
Programming and Setup 6-6
Replacement 11-234
Scan Tool Information 6-22
Body Control System
Description and Operation 11-237
Body Hinge Pillar
Lower Reinforcement Replacement 3-87
Body Leans or Sways in Corners 15-30
Body Lock Pillar
Inner Panel Replacement 3-98
Outer Panel Reinforcement Replacement 3-97
Outer Panel Sectioning 3-95
Body Panel Paint Protector Replacement 2-4
Body Pressure Relief Valve
Replacement 2-71
Body Side Outer Panel
Reinforcement Replacement 3-102
Body Side Upper
Front Applique Replacement 2-5
Body Waterleak Repair 1-85
Bosch Connectors 11-901, 11-903
Brake
Hydraulic and Assist System Diagnosis 5-153
Brake and Accelerator Pedal Assembly
Replacement 5-173
Brake Caliper
Bracket Replacement - Front 5-116
Bracket Replacement - Rear 5-119
Inspection 5-101
Overhaul - Front 5-110
Overhaul - Rear 5-113
Replacement - Front 5-108
Replacement - Rear 5-109
Brake Control Brake Pedal Position Sensor
Calibration 5-76
Brake Fluid
Loss 5-148
Brake Hose
Replacement - Front 5-192
Brake Pad
Inspection 5-100
Replacement - Front 5-103
Replacement - Rear 5-105
Brake Pedal
Excessive Effort 5-144
Excessive Travel 5-143
Position Sensor Calibration 4-170
Position Sensor Replacement 4-170, 4-171
Pulsation 5-138
Pushrod Inspection 5-165
Travel Measurement and Inspection 5-162
Brake Pipe and Hose Inspection 5-164
Brake Pipe Replacement - Front Left Side 5-188
Brake Pipe Replacement - Front
Right Side 5-186
Brake Pressure Modulator Solenoid Valve
Calibration 5-76
Brake Pressure Modulator Valve
Bracket Replacement 5-83
Front Brake Pipe Replacement 5-181
Pipe Replacement 5-179
Replacement 5-76
Brake Pressure Modulator Valve Hose
Replacement 5-176
Brake Pressure Modulator Valve Rear Brake Pipe
Replacement 5-183
Brake Rotor
Assembled Lateral Runout Correction 5-126
Assembled Lateral Runout Correction -
Correction Plates 5-128
Assembled Lateral Runout Correction -
Indexing 5-126
Assembled Lateral Runout Correction -
On-Vehicle Lathe 5-129
Assembled Lateral Runout Measurement 5-98
Drum Balance Inspection 1-57
Refinishing 5-130
Replacement 5-122
Replacement - Rear 5-124
Surface and Wear Inspection 5-98
Thickness Measurement 5-97
Thickness Variation Measurement 5-97

Brake System
External Leak Inspection 5-162
Internal Leak Test 5-163
Noise 5-139
Slow Release 5-147
Vehicle Road Test 5-161
Brake System, Hydraulic, Assist, and Control
Description and Operation 5-215
Brake Warning Indicator Malfunction 5-137
Brake Warning System
Description and Operation 5-218
Brakes
Brake Pad and Rotor Burnishing 5-108
Drag 5-145
Braking Action Uneven
Front to Rear 5-142
Pulls to One Side 5-140
Bushing and Mating Shaft Inspection 16-31
Bushing, Bearing, and Washer Locations 16-15

C

Cabin Heater
Coolant Heater System Leak Testing 10-16
Coolant Heater System Loss of Coolant 10-14
Coolant Heater System Pressure Cap Testing 10-15
Camber Adjustment
Front 15-64
Camber Description 15-64
Camera Image Display Module Replacement - Rear 12-52
Cargo Center Courtesy Lamp
Bulb Replacement 4-190
Case Porosity Repair 16-31
Caster Adjustment
Front 15-64
Caster Description 15-65
Cell Battery
Cooling Manifold Inlet Hose
Replacement 9-336, 9-338
Cooling Manifold Outlet Hose
Replacement 9-339, 9-342
High Voltage Sensor Replacement 9-461
Replacement 9-462, 9-467, 9-473, 9-479, 9-485, 9-490
Center Courtesy Lamp
Replacement 4-174, 4-175
Center Courtesy Lamp Bulb
Replacement 4-177
Center Courtesy Lamp Lens
Replacement 4-176
Center Pillar
Applique Replacement 2-6
Lower Trim Panel Replacement 2-63
Upper Trim Panel Replacement 2-62
Charge Port
Housing Replacement 9-648
Charge Port Door
Replacement 9-647
Charge Port Door Description and Operation 4-282
Charger Door
Ajar Indicator Malfunction 4-236, 4-238
Charging System
Description and Operation 9-34
Test 9-19
Checking Aftermarket Accessories 11-871
Chime
Malfunction 8-85
Circuit Protection
Circuit Breakers 11-883
Fuses 11-882
Fusible Links 11-883
Circuit Testing 11-871
Clear Secured High Voltage DTCs 9-539
Clearcoat Repair without Repainting 3-142
Clearcoat Thickness 3-143
Coaxial Cable Repairs 11-884
Communication Center Call Switch
Replacement 8-54
Communication Interface Module
Battery Replacement 8-56
Replacement 8-55
Component Connector End Views 11-455
Component Location
Automatic Transmission 16-14
Component Rotational Speed Calculation 1-41
Component Specifications
Disc Brakes 5-96
Compressor
Hose Assembly Replacement 10-31
Mounting Bracket Replacement 10-27
Replacement 10-26
Condenser
Replacement 10-43
Connector Position Assurance Locks 11-898
Connector Repairs 11-895
Content Theft Deterrent
Malfunction 12-187
Control Arm
Replacement - Lower 15-9
Control Module References 6-3
Control Module U Code List 11-18
Coolant Temperature Sensor
Replacement 9-271–9-273
Coolant/Water in Transmission 16-30
Cooling Fan
Malfunction 9-250
Cooling Fan and Shroud
Replacement 9-283
Cooling Fan Malfunction - DTC P148A-P148C 9-233
Courtesy Lamps
Malfunction 4-143
Cruise Control
Description and Operation 9-48
Indicator Malfunction 9-44

Cruise Control (cont'd)
Malfunction - DTC B3794, P0564, P0565, P0567, P0568, P056C, P0580, P0581, P155A-P155C, or P162C 9-45
Switch Replacement 9-47
Customer Concern Verification Sheets 1-10

D

Data Link Communications
Description and Operation 11-237
Data Link References 11-232
DC Charging Disabled Reset 9-656
DC Power Conversion Test 9-169
Definition of Danger, Warning, Caution, and Note 0-3
Definitions and Abbreviations 16-92
Defrosting
Insufficient 10-10
Delphi Connectors 11-905–11-908, 11-910, 11-913, 11-915
Diagnostic Procedure Instructions 6-84
Diagnostic Repair Verification 6-123
Diagnostic Starting Point
Vehicle DTC Information 6-90
Diagnostic System Check
Instructions 6-87
Vehicle DTC Information 6-91
Diagnostic Trouble Code (DTC) List
Vehicle DTC Information 6-92
Digital Radio
Poor or No Reception 8-14, 8-34
Dimensions
Body 3-68
Disassembled Views
Automatic Transmission 16-8
Disc Brake
System Description and Operation 5-131
System Diagnosis 5-148
Dome Lamps
Malfunction 4-145
Door Ajar Indicator
Description and Operation 4-282
Malfunction 4-240
Door Component Views 11-395
Door Handle
Replacement - Front Inside 4-260
Replacement - Front Outside 4-262
Replacement - Rear Inside 4-266
Rod Adjustment - Front Outside 4-272
Rod Replacement - Front Outside 4-273
Door Lock and Ignition Lock
Folding and Non-Folding Key Cutting 1-22
Door Lock Switch
Replacement 4-281
Door Open Indicator Switch
Replacement 4-256
Door Will Not Open/Close, Door Binding, or Locks, Handles, or Cylinders Do Not Function 4-252
Drain Cock
Radiator Drain Cock Replacement 9-286
Drive Motor
Replacement 16-45, 16-54
Drive Motor Battery
Charger Receptacle Replacement 9-652, 9-654
Charger Replacement 9-649
Coolant Cooler Bracket Replacement 9-311
Coolant Cooler Inlet Hose Replacement 9-335
Coolant Cooler Outlet Hose Replacement 9-316, 9-317
Coolant Cooler Replacement 9-308
Coolant Flow Control Valve Replacement 9-318
Coolant Inlet Hose Replacement 9-321–9-323
Coolant Inlet Pipe Replacement 9-324, 9-325, 9-327
Coolant Level Sensor Replacement 9-274
Coolant Outlet Hose Replacement 9-328
Coolant Pump Replacement 9-315
Coolant Radiator Replacement 9-312
Cooling System Draining and Filling 9-257
Current Sensor Replacement 9-497
Interface Control Module Replacement 9-512
Positive and Negative Cable Replacement 9-504, 9-507
Positive High Voltage Contactor Relay Replacement 9-499
Radiator Inlet Hose Replacement 9-329, 9-331, 9-332
Radiator Outlet Hose Replacement 9-334
Replacement and Shipping Preparation 9-524
System Description 9-545
Drive Motor Battery Cover
Replacement 9-449
Drive Motor Battery High Voltage Manual Disconnect Lever
Replacement 9-445
Drive Motor Generator Battery High Voltage Manual Disconnect Connector
Replacement 9-447
Drive Motor Generator Control Module
Coolant Pump Replacement 9-291
Cooling Outlet Hose Replacement 9-292–9-294, 9-296
Radiator Inlet Hose Replacement 9-297
Drive Motor Generator Power Inverter Module
3 Phase Cable Inspection 16-25
Assembly Replacement 9-184
Cooling Outlet Hose Replacement 9-268
Cooling System Draining and Filling 9-264
Description and Operation 9-193
Programming and Setup 6-8
Drive Motor Housing
Installation 16-88
Removal 16-63
Drive Motor Power Inverter Module
3 Phase Cable Replacement 9-182
Drive or Reverse Gear 16-32

Driver Information Center
Description and Operation 8-100
Switch Malfunction - DTC B3567 8-86
Driver Information Display
Switch Replacement 8-93
Driver or Passenger Seat
Cushion Frame Replacement 13-11
Cushion Pad Replacement 13-13
Head Restraint Guide Replacement 13-10
Head Restraint Replacement 13-9
Inner Adjuster Front Finish Cover
Replacement 13-4
Outer Adjuster Front Finish Cover
Replacement 13-5
Recliner Handle Replacement 13-16
Replacement 13-3
Driver or Passenger Seat Adjuster
Handle Knob Replacement 13-7
Driver or Passenger Seat Back
Cover and Pad Replacement 13-14
Cushion Frame Replacement 13-15
Cushion Heater Replacement 13-32
Driver or Passenger Seat Retractor Side Belt
Replacement
Driver or Passenger Seat Retractor Side
Belt Replacement 12-171
Drivetrain and Front Suspension Frame
Front Support Replacement 3-78
Replacement 3-131
Stabilizer Bracket Replacement 3-131
Drivetrain Front and Electronic System Power Supply
Module Frame
Replacement 3-121
DTC B0012 or B0013 12-105
DTC B0014, B0021, B0031, or B0038 12-109
DTC B0015, B001A, B001B, or B0022 12-113
DTC B0016, B0018, B0023 or B0025 12-117
DTC B0017 or B0024 12-120
DTC B0019 or B0020 12-123
DTC B0052 12-127
DTC B0071 12-128
DTC B0074 12-130
DTC B0081 12-132
DTC B0082 12-85
DTC B0083-B0088 12-135
DTC B0091 12-139
DTC B0098 12-142
DTC B010E 12-39
DTC B0158 8-81
DTC B0163 10-88
DTC B0173, B0178, or B3933 10-90
DTC B0183 10-96
DTC B018A, B048C, B048F, or B1395 10-93
DTC B0193 10-98
DTC B0223, B0233, B023A, or B0408 10-101
DTC B0283 4-8
DTC B0468, B046B, or B046C 10-104
DTC B046A 10-107
DTC B0550 8-83
DTC B096F 4-78
DTC B097B 11-818
DTC B1000 11-27
DTC B1001 ..... 11-28, 12-144
DTC B1015 12-41
DTC B1019 12-145
DTC B101D 11-29
DTC B101E 11-30
DTC B1025, B1035, B1045, or B1055 8-8
DTC B124F 8-84
DTC B125A 8-10, 8-47
DTC B125B 8-12
DTC B125C 8-14, 8-34
DTC B1271 8-16
DTC B1325, B1330, B1517, C0800, C0899,
C0900, C12E1, C12E2, P0562, P0563, P1A0C,
P1A0D, or P1EFC 9-9
DTC B1370 11-821
DTC B1370-B1379, B1380-B1389,
or B1440-B1443 11-823
DTC B1395 4-80
DTC B1405 8-104
DTC B1445 11-827
DTC B1446 or B1447 8-17
DTC B144A 11-829
DTC B144B 11-831
DTC B1451 11-834
DTC B147E or B147F 11-836
DTC B1480 4-83
DTC B1516 9-11
DTC B151A 9-13
DTC B1527 9-14
DTC B1529 8-106
DTC B2455 8-19
DTC B2462 ..... 8-21, 8-39
DTC B2470 8-24
DTC B2476 or B2482 8-26
DTC B2540 4-85
DTC B2545 4-87
DTC B2570 4-89
DTC B2575 or B2699 4-91
DTC B257A 4-94
DTC B2580 4-96
DTC B2585 or B3867 4-98
DTC B2610 4-102
DTC B2615 4-105
DTC B2645 4-107
DTC B2652 4-109
DTC B2745 5-8
DTC B2750 4-57
DTC B2955 12-5
DTC B3006 ..... 3-5, 3-9
DTC B302A 12-7
DTC B3031 12-9
DTC B3055 12-10
DTC B305C 12-12
DTC B3060 12-13
DTC B3101 12-57
DTC B3105 12-59

DTC B3106 12-60
DTC B3109-B3113 12-61
DTC B310D-B310F 12-62
DTC B3122 12-63
DTC B3123 12-65
DTC B3125, B3130, or B3135 ..... 4-222, 4-226
DTC B3140 or B3150 ..... 4-229, 4-233
DTC B3588 4-111
DTC B3596 4-113
DTC B3600 4-115
DTC B3622 8-108
DTC B3650 4-117
DTC B370B 4-290, 4-312
DTC B3715 or B3875 4-294
DTC B3806 4-119
DTC B3811 ..... 4-298, 4-316
DTC B3873 ..... 4-301, 4-309
DTC B3881 or B3882 4-121
DTC B3883 4-125
DTC B3884 4-127
DTC B389A 12-14
DTC B3902 12-16
DTC B3935 12-17
DTC B3948 or B3949 4-129
DTC B3950 or B3951 4-133
DTC B3976 12-18
DTC B3984 12-19
DTC C0035-C0050, C1207-C1210, C1221-C1228, or C1232-C1235 5-10
DTC C005A 5-14
DTC C0110, C12E0, C12E8, or C12E9 5-15
DTC C012A, C128B, C128E, or C12B2-C12B4 5-17
DTC C012B or C12B6-C12B8 5-19
DTC C012D, C120A, C128A, C128D, C12BC, C12BD, or C12BE 5-21
DTC C012E or C12FE 5-23
DTC C012F, C12A7, or C12DD 5-25
DTC C0161 5-27
DTC C0176 14-5
DTC C0186, C0187, C0196, or C0287 5-29
DTC C0201 5-31
DTC C0242 or P0856 5-33
DTC C0245, C122E 5-34
DTC C0256, C12E6, or C12E7 5-36
DTC C0267 5-135
DTC C0277 or C0890 4-137
DTC C027D 5-224
DTC C028A, C028B, or C028F 5-222
DTC C028E 5-225
DTC C0293 5-227
DTC C0294, C120C, or C12F8 5-38
DTC C0297 4-140
DTC C0298 5-230
DTC C0299 or C12FF 5-42
DTC C029C, C120C, C129A-C129F, C12B1, or C12F8 5-44
DTC C0460 14-7
DTC C0475 14-8
DTC C0545 14-9
DTC C0552 or C121D 5-48
DTC C0558 5-233
DTC C0561 ..... 5-50, 5-235
DTC C0569 15-38
DTC C056D 5-236, 11-31
DTC C056D, C127A-C127C, C12E9, C12F2-C12F6, or C12FE 5-52
DTC C056E 5-54, 5-238, 11-32
DTC C0574 ..... 5-55, 5-240
DTC C0710 5-56
DTC C0750, C0755, C0760, or C0765 15-39
DTC C0775 15-41
DTC C0847, C0848, C1240 or C1241 11-840
DTC C0857 or C1242 11-842
DTC C0870 or C12E4 5-58
DTC C0880, C12E5, or C120F 5-59
DTC C0898 5-61
DTC C1120 or C1121 5-63
DTC C1122 or C1123 5-65
DTC C1124 or C1125 5-67
DTC C1280 or C1281 5-242
DTC P0071-P0073 10-109
DTC P0480 9-205
DTC P0513 12-20
DTC P0532 or P0533 10-112
DTC P0534 10-114
DTC P0572 or P0573 9-40
DTC P0575 9-42
DTC P059F or P151E 3-49, 3-51
DTC P0601-P0604, P0606, or P062F 9-65, 11-33
DTC P0601-P0604, P0606, P062F, P0630, P16F3, or P262B 9-67
DTC P061A or P061B 9-69
DTC P0633 12-21
DTC P0641, P0697, or P06A3 9-70
DTC P0650, P263A, or P263B 9-72
DTC P06AF 9-74
DTC P06B1, P06B2, P06E7, or P06E8 9-76
DTC P06E4 11-35
DTC P0703 9-43
DTC P0711-P0713 16-18
DTC P0A0C or P0A0D 9-373
DTC P0A1B 9-77
DTC P0A1F, P1A01, P1A05, or P1A06 11-38
DTC P0A3F, P0A40, P0C52, P0C53, P0C5C, P0C5D, or P1B03 9-78
DTC P0A5E, P0A61, or P0A64 9-82
DTC P0A78 9-83
DTC P0A7E 9-207
DTC P0A7F 9-376
DTC P0A8D 9-85
DTC P0A9C-P0A9E, P0AC6-P0ACD, P0AE9-P0AEB, P0BC3-P0BC5, or P0C34-P0C36 9-209
DTC P0AA1, P0AA4, P0AD9, P0ADD, P0AE2, P0AE4, P0D0A, P0D11, P1EBC, P1EBE-P1EC0, or P1EC3-P1EC5 9-378

DTC P0AA6, P0DAA, P1AE6, or P1F0E 9-392
DTC P0ABB, P0ABC, or P0ABD 9-395
DTC P0AC4 9-86
DTC P0AEE, P0AEF, P0AF0, P0BD2-P0BD4, or P0BDC-P0BDE 9-87
DTC P0AF8 ..... 9-398, 10-121
DTC P0AFA or P0AFB 9-401
DTC P0B01, P0B04, or P0B07 9-89
DTC P0B0D 9-91
DTC P0B10, P0B11, or P0B13 9-405
DTC P0B3B-P0BBB, P1B16-P1B2D, P1B45-P1BFE, P1E01-P1E06, or P1E4C-P1E8B 9-408
DTC P0BE6-P0BE8, P0BEA-P0BEC, P0BEE, P0BEF, or P0BF0 9-92
DTC P0BFD 9-93
DTC P0C01 9-95
DTC P0C0B or P0C0E 9-97
DTC P0C11-P0C13 9-98
DTC P0C17 or P1B0F 9-100
DTC P0C19 9-103
DTC P0C28 9-104
DTC P0C43-P0C45 9-212
DTC P0C47, P0C4A, P1E8C, or P1E8D 9-215
DTC P0C4E 9-105
DTC P0C76 9-107
DTC P0C77 or P0C78 9-412
DTC P0CCC, P0CCE, or P0CCF 4-236, 4-238
DTC P0CD6-P0CD8 9-219
DTC P0CE2, P0CE3, P1EC7, P1EC8, or P1F56 9-222
DTC P0CE5-P0CE7 and P1F58 9-225
DTC P0CEF-P0CF1 9-231
DTC P0CF4-P0CF6 9-558
DTC P0CF9 or P0D01 9-561
DTC P0D1F 9-563
DTC P0D21-P0D23 9-564
DTC P0D2B or P0D2C 9-567
DTC P0D39-P0D3B, P0D49, P0D4E, P0D4F, P0D53, P0D54, P1ECB-P1ECD, P1ED0-P1ED2, P1ED6-P1ED9, P1EDB, P1EDC, P1EDE-P1EE1, P1EE3, P1EE5, P1EE7-P1EED, P1EFE-P1F02, or P1F14-P1F16 9-570
DTC P0D3E or P0D3F 9-572
DTC P0D40, P1EDA, P1EDD, or P1F03 9-575
DTC P0D43-P0D45 9-576
DTC P0D57-P0D59 9-578
DTC P0D5B, P0D5C, P1ECE, or P1EFD 9-581
DTC P0D5E 9-583
DTC P0D69-P0D7F 10-117
DTC P150D or P150E 9-108
DTC P151C or P2516-P2518 10-123
DTC P15B9 or P15BA 11-844
DTC P15F1 9-110
DTC P15FB 9-111
DTC P15FC 9-112
DTC P162B 12-22
DTC P1631 12-23
DTC P1649 12-24
DTC P16B7 11-39
DTC P16B8-P16BA 11-41
DTC P16C1-P16C5 11-42
DTC P16C6 11-43
DTC P16F2 9-113
DTC P16F3 9-115
DTC P16F4 9-116
DTC P16F6 9-118
DTC P179A 9-119
DTC P181C-P181F, P183A-P183E, P184A, or P184B 9-120
DTC P1824, P182A-P182F, P1838, or P1839 16-21
DTC P183F 9-123
DTC P1A07, P1E93, P1E99, P1E9F, P1EA5, P1FC3-P1FC8, P3035, or P3040 9-416
DTC P1A4F, P1A50, P1A51, P1ADC, or P1EB6 9-124
DTC P1A56 9-125
DTC P1A5E or P1A5F 11-846
DTC P1A60 11-848
DTC P1ADE or P1ADF 9-126
DTC P1AE8 or P1AE9 9-127
DTC P1AEC or P1AEE 9-128
DTC P1AF0 9-130
DTC P1AF4 or P1AF5 9-131
DTC P1B0B or P1B0C 9-132
DTC P1B0D 9-133
DTC P1B0F 9-134
DTC P1B12 5-69
DTC P1B15 9-137
DTC P1B41 9-138
DTC P1BFF, P1E23-P1E25, or P1EB8 9-139
DTC P1E00 9-140
DTC P1E0A 9-141
DTC P1E19 or P1E1A 9-142
DTC P1E1B-P1E1F 9-143
DTC P1E20-P1E22 9-145
DTC P1E27 or P1E28 9-146
DTC P1E29 9-147
DTC P1E2A-P1E2F 9-148
DTC P1E34-P1E36 9-149
DTC P1E37 9-150
DTC P1E38 9-151
DTC P1E39 9-152
DTC P1E3A 9-154
DTC P1E4A 9-155
DTC P1E8E-P1E91 or P1F06 11-45
DTC P1E92, P1E98, P1E9E, P1EA4, P1FC9, P1FCA-P1FCE, P3036, or P3041 9-418
DTC P1E94-P1E97 or P1F07 11-46
DTC P1E9A-P1E9D or P1F08 11-47
DTC P1EA0-P1EA3 or P1F09 11-48
DTC P1EAB-P1EB0 9-420
DTC P1EB1 11-49
DTC P1EB2-P1EB5, P1FA6-P1FAB, P3030, or P303B 11-50
DTC P1EB9 11-52

DTC P1EC1 or P1EC2 11-55
DTC P1ECA or P1EC9 10-126
DTC P1EE6 9-589
DTC P1EEF or P0D4A 9-592
DTC P1EF0 or P1EF1 9-594
DTC P1EF3-P1EF5 9-596
DTC P1EF6 or P1EF7 11-850
DTC P1EF8 11-57
DTC P1EFA or P1EFB 9-597
DTC P1F0A-P1F0D 10-128
DTC P1F17 9-427
DTC P1F59, P1F5A, or P1F5B 9-156
DTC P1F5D or P1F5E 9-159
DTC P1FAC, P1FB1, P1FB7, P1FBD, or P1FCF 11-59
DTC P1FAD, P1FB3, P1FB9, P1FBF, or P1FD1 11-60
DTC P1FAE, P1FB4, P1FBA, P1FC0, or P1FD2 11-61
DTC P1FAF, P1FB5, P1FBB, P1FC1, or P1FD3 11-62
DTC P1FB0, P1FB6, P1FBC, P1FC2, or P1FD4 11-63
DTC P1FB2, P1FB8, P1FBE, P1FD0, or P1FF3 11-64
DTC P1FD5-P1FF2 9-424
DTC P1FF4 9-429
DTC P1FFB-P1FFE 9-238
DTC P1FFF 9-240, 9-599
DTC P2122, P2123, P2127, P2128, or P2138 9-161
DTC P215B 16-24
DTC P2534 or P2535 11-852
DTC P2537 ..... 9-165, 11-854
DTC P257D-P257F 3-7
DTC P270A 16-100
DTC P2797 9-167
DTC P3002, P3003, P301F, or P3020 9-600
DTC P3005, P3006, P3021, or P3022 9-604
DTC P3008, P3009, or P3023 9-608
DTC P300B 9-611
DTC P300C, P300D, or P300F 9-614
DTC P3010, P3013, or P3014 9-616
DTC P3015, P3018, or P301B-P301E 9-618
DTC P301E 9-622
DTC P302A-P302D 9-625
DTC P302F 9-627
DTC P3031-P3034 or P3037 11-65
DTC P303C-P303F or P3042 11-66
DTC U0020 11-67
DTC U0073 or U2100 11-68
DTC U0074 11-69
DTC U0077 11-74
DTC U0078 11-80
DTC U007A 11-75
DTC U0100-U02FF 11-81
DTC U0300-U0336 11-86
DTC U0400-U05FF 11-87
DTC U1500-U15FF 11-88
DTC U179A 11-91
DTC U1803 11-94
DTC U1806 11-97
DTC U1807 11-98
DTC U180A 11-99
DTC U180B 11-100
DTC U180C 11-101
DTC U180D 11-102
DTC U1814 11-103
DTC U1817 11-105
DTC U1818 11-108
DTC U182D 11-111
DTC U182E 11-114
DTC U1833 11-117
DTC U1838 11-120
DTC U1839 11-123
DTC U183C 11-126
DTC U183E 11-129
DTC U1845 or U1846 11-132
DTC U184A 11-134
DTC U184B 11-137
DTC U184C 11-140
DTC U184D 11-143
DTC U184E 11-146
DTC U1858 11-149
DTC U185A 11-152
DTC U185B 11-157
DTC U185C 11-161
DTC U1860 11-164
DTC U1861 11-167
DTC U186A 11-170
DTC U186B 11-173
DTC U1876 11-176
DTC U1885 11-179
DTC U18A4 11-183
DTC U18B9-U18BF 11-186
DTC U2099 11-187
DTC U2401 11-189
DTC U2602 11-192
DTC U2603-U2606 or U2617-U2622 11-196
DTC U2608 11-198
DTC U2609 11-201
DTC U2611 11-204
DTC U2612 11-206
DTC U2613 11-209
DTC U2615 11-212
DTC U2623 or U2624 11-215
Dual Phase Steel 3-115
Dust Leaks 1-84

E

EL-48571 High Voltage Battery Pin Out Box Reference 9-368
Electric Differential Drive Motor Power Inverter Module Cooling Hose Replacement 9-270
Electrical Center Identification Views 11-430
Electrical Schematic Symbols 11-298
Electromagnetic Compatibility Description 9-196

Electronic Brake and Traction Control Module Bracket Replacement 5-74
Electronic Brake Control Module Programming and Setup 6-9
Replacement 5-75
Scan Tool Information 6-36
Electronic Component Description 16-93
Electronic Park Brake Control Module Programming and Setup 6-9
Control Module Scan Tool Information 6-39
Electronic Park Lock Description and Operation 11-958
Electronic Parking Brake Control Module Description 5-268
Control Module Replacement 5-247
Electronic Power Steering Motor Control Module Replacement 14-17
Electronic Vibration Analyzer (EVA) Description and Operation 1-73
Emblem/Nameplate Replacement 2-3
Engine Control Module Bracket Replacement 9-172
Replacement 9-171
Engine Control Module (ECM) Description and Operation 9-194
Engine Coolant Temperature Sensor Replacement - Heater Coolant Heater 10-76
Temperature Sensor Replacement - Radiator Side 9-285
Environmental Fallout (Acid Rain) 3-142
Evaporator Temperature Sensor Replacement 10-140
Exterior Lighting Systems Description and Operation 4-198

F

Fastener Tightening Specifications 9-53, 9-199, 9-347
12V Starting and Charging 9-7
ABS 5-5
Automatic Transmission 16-4
Bolted Exterior Body Panels and Closures 3-3
Bumpers and Fascias 3-47
Disc Brakes 5-96
Displays and Gauges 8-76
Entertainment System 8-3
Exterior Trim 2-3
Fixed and Moveable Windows 4-5
Frame and Underbody 3-118
Front Suspension 15-3
Horns 4-55
HVAC Systems 10-3
Hydraulic Brakes 5-133
Immobilizer 12-3
Instrument Panel and Console Trim 2-22
Interior Trim 2-50
Lighting Systems 4-66
Fastener Tightening Specifications (cont'd) Mirrors 4-202
Park Brake 5-220
Power Steering System 14-3
Rear Suspension 15-19
Remote Functions 12-54
Seat Belts 12-81
SIR 12-100
Steering Wheel and Column 14-24
Tire Pressure Monitoring 15-37
Tires and Wheels 15-48
Transmission Cooling 16-105
Vehicle Access 4-218
Wheel Alignment 15-63
Wheel Drive Shafts 7-3
Wiper and Washer System 4-286
Wiring Systems and Power Management 11-251
Fasteners 1-16
FCI Connectors 11-916, 11-917
FEP Connectors 11-918
Fixed Antenna Replacement 8-60
Flat Wire Repairs 11-887
Floor Carpet Drying 2-18
Floor Panel Carpet Replacement 2-19
Floor Panel Number 6 Cross Bar Replacement 3-109
Fluid and Lubricant Recommendations 1-32
Fluid Leak Diagnosis 16-30
Fluid Pump Assemble 16-77
Cleaning and Inspection 16-76
Disassemble 16-74
Fluid Temperature Sensor Replacement 16-41
Flushing 10-19
Folded-Over Wire Repair 11-887
Front and Rear Row Seat Roof Rail Airbag Replacement 12-163
Front and Rear Side Door Outside Handle Rod Clip Replacement 4-263
Front Brake Shield Replacement 5-125
Front Bumper Lower Shutter Actuator Replacement 3-60
Lower Shutter Replacement 3-59
Front Bumper Fascia Emblem/Nameplate Replacement 2-11
Energy Absorber Replacement 3-54
Opening Cover Replacement 3-61
Replacement 3-57
Side Bracket Replacement 3-58
Front Bumper Fascia Air Deflector Replacement 3-62
Front Bumper Impact Bar Fog Lamp Access Hole Cover Replacement 2-10

Front Bumper Lower Impact Bar
Replacement 3-56
Front Compartment
Air Deflector Replacement 3-125
Front Sight Shield Replacement 3-39
Side Rail Bracket Replacement 3-80
Upper Side Rail Replacement 3-83
Front Differential Carrier
Installation 16-85
Removal 16-66
Front End Inflatable Restraint
Discriminating Sensor Replacement 12-154
Front Fender
Insulator Replacement 3-31
Replacement - Left Side 3-17
Replacement - Right Side 3-18
Front Floor Console
Center Compartment Liner Replacement 2-47
Compartment Liner Replacement 2-46
Cup Holder Liner Replacement 2-44
Front Compartment Replacement 2-43
Front Cover Replacement 2-49
Rear Cup Holder Liner Replacement 2-45
Replacement 2-48
Front Heated Seat
Malfunction 13-29
Front Hinge Pillar
Body Sectioning 3-85
Front Lower Control Arm
Bushing Replacement - Rear 15-11
Front Lower Grille
Replacement 2-14
Front of Vehicle/Engine Compartment
Component Views 11-374
Front Seat
Outboard Seat Back Airbag
Replacement 12-164
Front Seat Adjuster
Replacement 13-6
Front Seat Belt
Anchor Plate Tensioner Replacement 12-170
Buckle Replacement 12-94
Guide Adjuster Replacement 12-96
Front Seat Cushion
Cover and Pad Replacement 13-12
Heater Replacement 13-33
Front Seat Heater
Switch Replacement 13-31
Front Seat Heater Switch Bezel
Replacement 2-42
Front Side Door
Adjustment 3-12
Check Link Replacement 3-34
Hinge Replacement 3-25
Inside Handle Rod Replacement 4-261
Replacement 3-13
Stationary Window Replacement 4-39
Trim Panel Applique Replacement 2-54
Trim Replacement 2-53
Front Side Door (cont'd)
Upper Trim Panel Replacement 2-52
Weatherstrip Replacement - Body Side 3-42
Weatherstrip Replacement - Door Side 3-41
Wiring Harness Replacement 3-21
Front Side Door Armrest Switch Mount Plate
Replacement 2-51
Front Side Door Lock
Cylinder Replacement 4-257
Replacement 4-268
Striker Adjustment 4-278
Striker Replacement 4-278
Front Side Door Lock Cylinder
Rod Replacement 4-271
Front Side Door Locking Rod
Replacement 4-270
Front Side Door Sill Garnish Molding
Replacement 2-57
Front Side Door Window
Inner Sealing Strip Replacement 4-46
Outer Sealing Strip Replacement 4-45
Regulator Replacement 4-43
Switch Replacement - Left Side 4-41
Switch Replacement - Right Side 4-40
Weatherstrip Replacement 4-49
Window Replacement 4-31
Front Side Door Window Channel
Replacement 4-37
Front Side Door Window Frame
Front Applique Replacement 2-7
Rear Applique Replacement 2-8
Front Suspension
Description and Operation 15-17
Front Turn Signal Lamp Bulb
Replacement 4-187, 4-188
Front Upper Grille
Replacement 2-13
Front Wheel Drive Shaft
Inner Joint and Boot Replacement 7-10
Oil Seal Installation - Left Side 16-79
Oil Seal Installation - Right Side 16-80
Oil Seal Removal - Left Side 16-72
Oil Seal Removal - Right Side 16-71
Outer Joint and Boot Replacement 7-13
Replacement - Left Side 7-4
Replacement - Right Side 7-7
Seal Replacement - Left Side 16-44
Seal Replacement - Right Side 16-45
Front Wheelhouse
Liner Replacement - Left Side 3-139
Liner Replacement - Right Side 3-138
Front Wheelhouse Panel
Replacement 3-82
Fuel Economy Indicator Switch
Replacement 8-98
Full-Cut Method Description 4-51

G

General Electrical Diagnosis 11-871
General Plastic Repair 3-144
Generator Control Module
  Coolant Hose Replacement 9-298
GM Oil Life System Resetting 1-33
GMLAN and Media Oriented Systems
  Transport (MOST) Wiring Repairs 11-952
Graphics/Decals/Emblems 2-3
Ground Repair 11-954
Ground Views 11-411

H

Handling of Refrigerant Lines and Fittings 10-4
Harness Routing Views 11-252
Hazard Lamps
  Malfunction 4-148
Hazard Warning Switch Replacement 4-173
Headlamp Bracket
  Replacement 4-181, 4-182
Headlamps
  Aiming 4-183, 4-184
  Bulb Replacement 4-179, 4-180
  Malfunction 4-150
  Replacement 4-178
Headliner
  Harness Replacement 2-21
Headlining Trim Panel
  Replacement 2-20
Heated Mirrors
  Malfunction 4-204
Heated Oxygen Sensor
  Wiring Repairs 11-890
Heated Seats
  Description and Operation 13-34
Heater
  Core Replacement 10-73
Heater and Air Conditioning
  System Description and Operation 10-77
Heater and Air Conditioning Evaporator and Blower
  Lower Case Replacement 10-47
  Module Replacement 10-43
  Upper Case Replacement 10-46
Heater Coolant
  Heater Draining and Filling 10-21
  Heater Replacement 10-74
Heater Coolant Heater Bracket
  Replacement 10-75
Heater Coolant Pump
  Replacement 10-56
Heater Inlet and Outlet Pipe Replacement 10-53
Heater Inlet Hose
  Replacement 10-50
Heater Outlet Hose
  Replacement 10-54
Heating
  Performance Diagnostic 10-8
High Effort While Tilting Column 14-24
High Mount Stop Lamp
  Replacement 4-189
High Strength Low Alloy Steel 3-116
High Temperature Wiring Repairs 11-889
High Voltage
  Battery Disconnect Cable Replacement 9-458
  Disabling 9-363
  Enabling 9-367
  Safety 9-362
  System Inspection 9-441
High Voltage Battery Disconnect Control Module
  Module
  Replacement 9-175, 9-179
High Voltage Disconnect Circuit Connector Cover
  Replacement 9-174
High Voltage Monitoring Systems
  Description 9-196
Hill Start Assist Malfunction 5-70
Hood
  Adjustment 3-29
  Replacement 3-30
Hood Ajar Indicator
  Description and Operation 3-46
  Lamp Switch Replacement 12-31
Hood Ajar Indicator/Message
  Malfunction 3-5, 3-9
Hood Hinge
  Replacement 3-26
Hood Hold-Open Rod
  Replacement 3-36
Hood Insulator
  Replacement 3-32
Hood Primary and Secondary Latch
  Replacement 3-33
Hood Primary Latch
  Release Cable Handle Replacement 3-24
  Release Cable Replacement 3-11
Hood Rear Weatherstrip
  Replacement 3-37
Horn
  Malfunction 4-59
  Replacement 4-62
  System Description and Operation 4-64
How to Identify Plastic Parts 3-144
How to Use Electrical Schematics 11-272
Hub/Axle Flange and Wheel Stud
  Runout Inspection 1-57
Hub/Wheel Bearing Replacement 15-5
HVAC Component Replacement
  Reference 10-87
HVAC Control
  Assembly Replacement - Auxiliary 10-135
HVAC System Control Module
  Programming and Setup 6-11
HVAC System Malfunction 10-130
Hybrid Battery
  Interface Control Module Programming and
    Setup 6-11
  Pack Coolant Passage Leak Test 9-257

Hybrid Controls
Electronic Component Views 9-64
Hybrid Cooling System
Description and Operation 9-343
Leak Test 9-256
Loss of Coolant 9-253, 9-254
Pressure Cap Testing 9-256
Hybrid Modes of Operation Description 9-197
Hybrid Powertrain Control Module 2
Programming and Setup 6-12
Replacement 11-236
Scan Tool Information 6-61
Hybrid Powertrain Control Module Scan Tool
Information 6-54
Hybrid/EV Battery
Cell Balancing 9-541
System Verification 9-543
Hybrid/EV Battery Pack
Capacity Learn 9-541
Coolant Control Solenoid Valve Learn 9-343
Coolant Heater Malfunction 9-251
Coolant Heater Malfunction - DTC
P1EC6 9-235
Coolant Pump Malfunction 9-246
Hybrid/EV Battery Voltage Present 9-437
Hybrid/EV Electronics Coolant Pump
Malfunction 9-248
DTC P0CE9, P0CEA, P1F44, or P1F45 9-228
Hybrid/EV Electronics Cooling Diagnostic 9-241
Hybrid/EV System High Voltage Isolation
Description 9-545
Hydraulic Brake
Component Operation Visual Inspection 5-163
System Bleeding 5-211, 5-212
System Description and Operation 5-218
System Flushing 5-213

I

Ignition and Start
Switch Replacement 11-957
Ignition Can/Cannot Be Turned Off with
Transmission in Any Gear 11-856
Ignition Lock Key Transmitter Antenna
Bracket Replacement 12-75
Replacement - Floor Console 12-73
Replacement - Rear Compartment 12-74
Immobilizer
Control Module Programming and Setup 6-13
Description and Operation 12-32
Impact Bar
Replacement - Front Bumper 3-55
Increase in Effort While Turning Steering
Wheel 14-11
Indicator/Warning Message
Description and Operation 8-100
Inducing Intermittent Fault Conditions 11-879
Inflatable Restraint
Front Passenger Presence Module
Replacement 12-162
Inflatable Restraint (cont'd)
Front Side Door Side Impact Sensor
Replacement 12-168
Instrument Panel Compartment Module
Disable Switch Replacement 12-169
Passenger Presence System Scan Tool
Information 6-73
Sensing and Diagnostic Module Scan Tool
Information 6-74
Inflatable Restraint Module Handling and
Scrapping 12-173
Inflatable Restraint Sensing and Diagnostic Module
Programming and Setup 6-13
Information Center Telltale Assembly
Replacement 8-94
Inline Harness Connector End Views 11-761
Inside Air Moisture and Windshield
Temperature Sensor Replacement 10-143
Inside Air Temperature Sensor
Replacement - Left Side Lower 10-141
Replacement - Right Side Upper 10-142
Inside Rearview Mirror
Replacement 4-215
Wiring Harness Cover Replacement 4-216
Inspection/Maintenance (I/M)
System Check 6-123
Instrument Cluster
Description and Operation 8-101
Display Malfunction 8-88
Gauges Malfunction 8-87
Programming and Setup 6-14
Rear Cover Replacement 8-96
Replacement 8-95
Scan Tool Information 6-77
Instrument Panel
Airbag Replacement 12-159
Center Support Bracket Replacement 2-39
Center Trim Plate Applique Replacement 2-25
Fuse Block Access Hole Cover
Replacement 2-27
Knee Bolster Replacement 2-22
Lower Airbag Bracket Replacement 12-153
Lower Airbag Replacement -
Driver Side 12-160
Lower Airbag Replacement -
Passenger Side 12-161
Outer Trim Cover Replacement 2-28
Tie Bar Replacement 2-40
Trim Pad Radio Speaker Opening Cover
Replacement 2-38
Trim Pad Replacement 2-31
Upper Molding Retainer Replacement 2-26
Instrument Panel Center Air Outlet
Duct Replacement 10-66
Replacement 10-64
Instrument Panel Compartment
Door Latch Replacement 2-30
Door Latch Striker Replacement 2-31
Replacement 2-29

Instrument Panel Outer Air Outlet
Replacement - Left Side 10-63
Replacement - Right Side 10-65
Instrument Panel Trim Plate
Applique Replacement - Left Side 2-24
Applique Replacement - Right Side 2-23
Instrument Panel/Center Console
Component Views 11-382
Interior Backlighting
Malfunction 4-156
Interior Lighting System
Description and Operation 4-200
Intermediate Steering Shaft
Replacement 14-28
Intermediate Steering Shaft Boot Replacement
Steering 14-26
Intermediate Steering Shaft Inner Boot
Replacement 14-27

J

JST Connectors 11-919

K

K20 Engine Control Module
Programming and Setup 6-10
Scan Tool Information 6-40
Key with Integrated Transmitter
Programming 12-28
Keyless Entry
System Description and Operation 12-79
System Malfunction 12-69
Keyless Entry Control Module
Programming and Setup 6-14
Replacement 12-76
Scan Tool Information 6-78
Keyless Entry Control Module Bracket
Replacement 12-77
Kostal Connectors 11-921, 11-923

L

Lead/Pull Description 15-65
Leaf Button Malfunction 8-89
Leak Testing 10-4
Liftgate
Adjustment 3-19
Emblem/Nameplate Replacement 2-4
Hinge Replacement 3-27
Latch Replacement 4-265
Latch Striker Replacement 4-279
Liftgate Wiring Harness Replacement 3-22
Lock Cylinder Replacement 4-259
Outside Handle Emblem Replacement 2-12
Outside Handle Replacement 4-264
Replacement 3-20
Sill Garnish Molding Replacement 2-69
Strut Replacement 3-40
Trim Finish Panel Replacement 2-70
Weatherstrip Replacement 3-43
Liftgate Window
Replacement 4-32
Lifting and Jacking the Vehicle 1-27
Lock Cylinder Coding
Front Side Door 1-22, 1-24
Ignition 1-25
Rear Compartment Lid 1-26
Lock Replacement
Rear Door 4-269
Looseness in Steering Column 14-25
Loss of Isolation on the High Voltage
Main Bus 9-430
Low Tire Pressure Indicator
Malfunction 15-42
Lubrication
Description 16-95
Luggage Compartment/Rear of Vehicle
Component Views 11-401

M

Main Shaft
Installation 16-87
Removal 16-64
Maintenance Items 1-32
Maintenance Replacement Parts 1-32
Maintenance Schedule 1-33
Manual Shift Shaft
Position Switch Installation 16-82
Position Switch Removal 16-68
Seal Installation 16-83
Seal Removal 16-69
Master Cylinder
Fluid Level Sensor Replacement 5-173
Replacement 5-168
Reservoir Filling 5-165
Reservoir Replacement 5-165
Master Electrical Component List 11-343
Master Electrical Schematic Icons 11-313
Measuring Frequency 11-875
Measuring Voltage 11-875
Measuring Voltage Drop 11-875
Memory Steer 15-31
Description 15-65
Mild Steel 3-116
Mobile Telephone
Microphone Replacement 8-53
Mode Control Cam Actuator
Replacement 10-138
Mode Valve
Link Replacement 10-137
Molex Connectors 11-925, 11-927
Motor Control
Module 1 Scan Tool Information 6-78
Mounting and Hardware
Inspection - Front 5-101
Inspection - Rear 5-102
Multimedia Receptacle
Replacement 8-58

N

No Drive in All Ranges 16-33
No Global Positioning System (GPS) Reception 8-21, 8-39
No Park or Drive 16-32
No Remote Detected 12-67
No Reverse 16-33
Noise
  Click in Turns 7-3
  Clunk When Accelerating During Turns 7-4
  Clunk When Accelerating from Coast 7-3
  Exterior Windnoise 1-31
  In Steering Column 14-24
  Interior Windnoise 1-31
  No (or Noisy) OnStar Audio 8-37
  Rattle, Clunk or Shudder 14-10
  Whine or Growl 14-10
  Whine/Growl Noise That Changes with Vehicle Speed 16-32
Noise and Vibration Analysis 16-32
Noise Diagnosis
  Blower Motor 10-10
  Front Suspension 15-32
  HVAC Module 10-12
  Rear Suspension 15-33

O

Object Alarm Module
  Programming and Setup 6-15
  Scan Tool Information 6-79
Object Detection
  Description and Operation 12-52, 12-53
Odor Correction 10-17
Odor Diagnosis 10-13
Odors
  Eliminating Unwanted Odors in Vehicles 2-18
OnStar
  Button LED Inoperative 8-42
  Call Center Remote Function Requests Inoperative 8-44
  Description and Operation 8-63
  Microphone Inoperative - Caller Cannot Be Heard 8-36
  One or More Buttons Inoperative 8-45
  Steering Wheel Control Functions Malfunction 8-47
  Stolen Vehicle Slowdown Active 12-25
  Voice Recognition Inoperative 8-52
Oscilloscope Diagnostic Kit Description and Operation 1-75
Output Shaft
  Installation 16-90
  Removal 16-61
Outside Mirror
  Description and Operation 4-216
Outside Rearview Mirror
  Glass Replacement 4-213
  Housing Cover Replacement 4-210, 4-211
Outside Rearview Mirror (cont'd)
  Inner Actuator Replacement 4-213
  Remote Control Switch Replacement 4-212
  Replacement 4-209

P

P-Metric Sized Tires Description 15-60
Paint Gauges 3-143
Park Brake
  Adjustment 5-267
  Cable Automatic Adjuster Disabling 5-264
  Cable Automatic Adjuster Enabling 5-264
  Cable Replacement - Left Rear 5-256
  Cable Replacement - Rear 5-254
  Cable Replacement - Right Rear 5-258
  Description and Operation 5-269
  Hardware Inspection 5-247
  Shoe Replacement 5-249
  System Diagnosis 5-245
  Will Not Hold or Release 5-245
Park Pawl
  Installation 16-86
  Removal 16-65
Park, License, and/or Tail Lamps
  Malfunction 4-160
Parking Assist
  System Malfunction 12-42
Parking Brake
  Actuator Switch Replacement 5-265
Passenger Compartment
  Air Filter Replacement 10-57
Passenger Compartment/Roof Component Views 11-388
Passenger Presence System
  Programming and Setup 6-15
  Rezeroing Procedure 12-147
Passenger Seat Belt
  Front Passenger Presence Sensor Replacement 12-92
Pedestrian Alert System Malfunction 12-44
Pedestrian Sound Alert Module
  Replacement 12-48
Pedestrian Sound Alert Speaker
  Replacement 12-49
Plastic Identification and Refinishing Systems 3-145
Plenum Front Panel
  Replacement 3-38
Plug-In Charging
  Indicator Malfunction 9-644
  Malfunction 9-634, 9-639
  System Description and Operation 9-657
Power Door Lock
  Description and Operation 4-283
  Key Cylinder Switches Malfunction 4-242
  Malfunction 4-244
Power Mirror
  Malfunction 4-206

Power Mode
Description and Operation 11-958
Mismatch 11-857
Power Outlet
Description and Operation 11-250
Receptacle Malfunction 11-246
Power Steering
Gear Replacement 14-18
Power Steering Control Module
Programming and Setup 6-15
Scan Tool Information 6-79
Power Steering System
Description and Operation 14-22
Power Windows
Description and Operation 4-51
Malfunction 4-13, 4-18
Powertrain
Component Views 11-380
Powertrain Diagnostic Trouble Code (DTC)
Type Definitions 6-92
Pretensioner Handling and Scrapping 12-179
Probing Electrical Connectors 11-872

Q

Quarter Inner Panel
Replacement 3-108
Quarter Outer Panel
Sectioning 3-105
Quarter Window
Trim Finish Panel Replacement 2-64

R

Rack and Pinion
Boot Replacement - On Vehicle 14-15
Radiator
Air Lower Baffle and Deflector
Replacement 9-301
Air Upper Baffle and Deflector
Replacement 9-302, 9-303
Lower Bracket Replacement 9-287
Overflow Hose Replacement 9-282
Upper Bracket Replacement 9-289
Radiator Grille
Guard Replacement 9-300
Radiator Lower Insulator
Replacement 9-288
Radiator Surge Tank
Clamp Bracket Replacement 9-279, 9-280
Replacement 9-276–9-278
Support Bracket Replacement 9-281
Radiator Upper Insulator
Replacement 9-290
Radio
Poor Reception 8-10, 8-47
Programming and Setup 6-16
Replacement 8-57
Scan Tool Information 6-80
Radio Antenna
Base Replacement 8-59
Radio Control
Switch Replacement 8-63
Radio Front Speaker
Replacement 8-61
Radio/Audio System
Description and Operation 8-69
Rail Dust Damage Repair 3-143
Range Selector
Lever Cable Adjustment 16-37
Lever Cable Bracket Replacement 16-38
Lever Cable Replacement 16-36
Re-Calibrating Actuators 10-133
Rear Axle
Replacement 15-24
Rear Brake
Front Pipe Replacement 5-202, 5-205
Hose Replacement 5-209
Rear Brake Intermediate Number 1 Pipe
Replacement 5-194
Rear Brake Intermediate Number 2 Pipe
Replacement 5-196
Rear Brake Pipe
Replacement 5-199
Rear Bumper
Impact Bar Replacement 3-66
Rear Bumper Fascia
Bracket Replacement - Side 3-64
Replacement 3-63
Rear Bumper Lower Fascia
Replacement 3-65
Rear Coil Spring
Replacement 15-23
Rear Compartment
Courtesy Lamp Replacement 4-198
Floor Panel Rail Replacement 3-92
Floor Panel Replacement 3-103
Stowage Shelf Replacement 2-67
Rear Compartment Lamp
Malfunction 4-163
Rear Door
Window Belt Inner Sealing Strip
Replacement 4-47
Rear End Panel
Replacement 3-112
Rear End Spoiler
Replacement 2-17
Rear Fog Lamps
Malfunction 4-146
Rear Hatch/Gate Description and
Operation 4-285
Rear Lamp Monitor Light Conductor Harness
Replacement 4-195
Rear License Plate Lamp
Replacement 4-191
Rear Object Alarm Control Module
Replacement 12-50

Rear Parking Assist Alarm
Sensor Replacement 12-51
Rear Parking Brake
Adjuster Replacement 5-260
Anchor Backing Plate Replacement 5-265
Rear Seat
Bolster Airbag Replacement 12-165
Rear Seat Back
Cushion Cover Replacement 13-26
Rear Seat Back Bolster
Replacement 13-19
Rear Seat Back Cushion
Removal and Installation 13-24, 13-25
Rear Seat Back Cushion Latch
Replacement 13-23
Rear Seat Belt
Retractor Replacement 12-97
Rear Seat Cup Holder
Replacement 2-56
Rear Seat Cushion
Cover and Pad Replacement 13-20
Removal and Installation 13-21
Rear Seat Head Restraint
Guide Replacement 13-18
Replacement 13-17
Rear Seat Latch Knob
Replacement 13-22
Rear Side Door
Adjustment 3-15
Check Link Replacement 3-35
Inside Handle Cable Replacement 4-257
Outside Handle Replacement 4-267
Outside Handle Rod Adjustment 4-276
Outside Handle Rod Replacement 4-277
Replacement 3-16
Upper Hinge and Lower Hinge
Replacement 3-28
Upper Rear Trim Panel Replacement 2-55
Weatherstrip Replacement - Body Side 3-45
Weatherstrip Replacement - Door Side 3-44
Window Switch Bezel Replacement 2-50
Rear Side Door Lock
Striker Adjustment 4-280
Striker Replacement 4-280
Rear Side Door Locking Rod
Replacement 4-274
Rear Side Door Locking Rod Bellcrank Rod
Replacement 4-275
Rear Side Door Sill Garnish Molding
Replacement 2-58
Rear Side Door Trim
Replacement 2-68
Rear Side Door Window
Replacement 4-32
Weatherstrip Replacement 4-50
Rear Side Door Window Channel
Replacement 4-38
Rear Side Door Window Frame
Front Applique Tape Replacement 2-9
Rear Side Door Window Switch
Replacement 4-42
Rear Side Door Wiring Harness
Replacement 3-23
Rear Suspension
Description and Operation 15-27
Rear Vision Camera
System Malfunction 12-46
Rear Washer
System Malfunction 4-298, 4-316
Rear Wheelhouse
Panel Liner Replacement 3-140
Rear Window
Panel Stowage Compartment Cover
Replacement 2-66
Wiper Blade Replacement 4-331
Rear Window Defogger
Description and Operation 4-53
Malfunction 4-10
Rear Window Washer Nozzle
Replacement 4-322
Rear Window Wiper Motor
Replacement 4-333
Rear Wiper
System Malfunction 4-290, 4-312
Receiver and Dehydrator
Replacement 10-39
Rechargeable Energy Storage System
Smoke Test 9-440
Reed Tachometer Description 1-81
Refrigerant
Recovery and Recharging 10-17
Registered and Non-Registered
Trademarks 1-20
Relay Replacement 11-953
Remote Control Door Lock
Receiver Programming and Setup 6-18
Receiver Replacement 12-78
Remote Control Replacement 10-134
Remote Vehicle Speed Limiting
Description and Operation 12-34
Remote Vehicle Start Malfunction 12-71
Repairing Connector Terminals 11-949
Repairing Damaged Wire Insulation 11-883
Repairs and Inspections Required After a
Collision 12-172
Retained Accessory Power
Description and Operation 11-962
Malfunction 11-863
Ride Diagnosis 15-28
Road Test Procedure 16-29
Rocker Inner Panel
Replacement 3-94
Rocker Outer Panel
Sectioning 3-100
Rocker Panel
Molding Replacement 2-15
Roof Front Header
Panel Replacement 3-90

Roof Outer Panel
Replacement 3-88
Roof Panel
Joint Finish Molding Replacement 2-16
Roof Rear Header
Panel Replacement 3-91
RPO Code List 1-13

S

Scan Tool Does Not Communicate with
Chassis High Speed GMLAN Device 11-219
High Speed GMLAN Device 11-224
Low Speed GMLAN Device 11-229
Scan Tool Does Not Power Up 11-218
Scan Tool Snapshot Procedure 11-881
Schematics
ABS 5-6
Active Grille Air Shutter 3-48
Audible Warnings 8-80
Automatic Transmission Controls 16-7
Body Control Systems 11-14
Cellular Telephone 8-7
Cigar Lighter/Power Outlet 11-245
Cruise Control 9-39
Data Communications 11-6
Defogger 4-7
Door Lock/Indicator 4-219
Driver Information System 8-78
Exterior Lamps 4-70
Fog Lamps 4-69
Ground Distribution 11-333
Headlamps/Daytime Running Lamps 4-67
Heated/Cooled Seat 13-28
Hood Latch 3-4
Horns 4-56
HVAC Systems - Automatic 10-81
Hybrid Controls 9-54
Hybrid/EV Cooling 9-201
Hybrid/EV Energy Storage 9-348
Hydraulic Brake 5-134
Immobilizer 12-4
Instrument Cluster 8-77
Interior Lamps 4-74
Interior Lamps Dimming 4-76
Moveable Window 4-6
Object Detection 12-36
OnStar 8-6
Outside Rearview Mirror 4-203
Park Brake 5-221
Plug-In Charging 9-553
Power Distribution 11-314
Power Moding 11-327
Power Steering System 14-4
Radio/Navigation 8-4
Release Systems 4-221
Remote Function 12-55
Seat Belts 12-82
Shift Lock Control 16-99
SIR 12-101
Schematics (cont'd)
Starting and Charging 9-8
Steering Wheel Secondary/Configurable Control 8-103
Theft Deterrent 12-186
Wiper and Washer Systems 4-287
Schematics RPO Code List 11-313
Scrub Radius Description 15-65
Seal Locations 16-16
Sealers, Adhesives, and Lubricants 15-48
Sealing Strip
Replacement - Rear Door Window Belt Outer 4-48
Sealing Washer Replacement 10-29
Seat Belt
Buckle Replacement - No. 1 Rear 12-95
Does Not Retract - One 12-87
Indicator Circuit Malfunction - Driver 12-87
Indicator Circuit Malfunction - Passenger 12-89
Latch Stop Installation 12-93
Repairs and Inspections Required after a Collision 12-93
System Description and Operation 12-98
Security Indicator
Malfunction 12-188
Sensor Replacement
Tire Pressure Indicator 15-43
Service Port
Valve Core Replacement 10-38
Shift Lock Control
Description and Operation 16-103
Shift Shaft Cover
Installation 16-84
Removal 16-67
Shock Absorber
Replacement 15-22
Shock Absorbers or Struts
On-Vehicle Testing 15-34
Shudder or Vibration During Acceleration 7-4
Side Door Window Mechanical Diagnosis 4-25
Side Window Defogger Outlet
Duct Replacement - Left Side 10-69
Duct Replacement - Right Side 10-70
SIR
Disabling and Enabling 12-151
Service Precautions 12-152
SIR/SRS Wiring Repairs 11-894
Soap Suds or Bubble Test 1-31
Speaker Malfunction 8-49
Speaker Replacement
Rear 8-62
Reference 8-49
Special Tools
12V Starting and Charging 9-37
ABS 5-95
Automatic Transmission 16-96
Cellular, Entertainment, and Navigation 8-73, 8-74
Collision Repair 3-117

Special Tools (cont'd)
Disc Brakes 5-132
Fixed and Moveable Windows 4-54
Front Suspension 15-17
HVAC Systems 10-77
Hybrid/EV Battery Heating and Cooling 9-344
Hybrid/EV Controls 9-197
Hybrid/EV Energy Storage 9-549
Hydraulic Brakes 5-219
Ordering Information 1-28
Park Brake 5-269
Plug-In Charging 9-658
Power Outlets 11-250
Power Steering System 14-23
Programming and Setup 6-19
Rear Suspension 15-27
SIR 12-184
Squeaks and Rattles 1-35
Steering Wheel and Column 14-36
Tire Pressure Monitoring 15-47
Transmission Cooling 16-121
Vibration Diagnosis and Correction 1-82
Wheel Drive Shafts 7-17
Wiring Systems and Power Management 11-963
Specifications
Brake Components 5-133
Hydraulic Brake System 5-133
Tires and Wheels 15-48
Speedometer and/or Odometer Malfunction 8-90
Splash Shield
Replacement - Front Compartment 3-119–3-121
Splicing Copper Wire Using Splice Sleeves 11-890
Splicing Inline Harness Diodes 11-894
Splicing Twisted or Shielded Cable 11-893
Sport Mode Indicator Malfunction 9-168
Spring, Strut, and/or Strut Component Replacement 15-15
Squeaks and Rattles 1-34
Stabilizer Shaft
Link Replacement 15-5
Replacement 15-4
Stationary Window
Description 4-53
Waterleak Repair 1-86
Steering
Effort Hard or Too Easy in One or Both Directions 14-13
Poor Return of Steering Wheel 14-11
Wheel Surges/Jerks While Turning 14-12
Steering Angle Sensor
Centering Procedure 5-74
Steering Column
Lower Trim Cover Replacement 14-30
Replacement 14-34
Upper Trim Cover Replacement 14-29
Steering Knuckle
Replacement 15-7
Steering Linkage
Inner Tie Rod Replacement 14-21
Steering Wheel
Airbag Coil Replacement 12-158
Airbag Replacement 12-155
Horn Contact Replacement 4-63
Replacement 14-32
Spoke Lower Cover Replacement 14-33
Steering Wheel and Column
Description and Operation 14-35
Steering Wheel Controls
Description and Operation 8-112
Malfunction 8-110
Stop and Tail Lamp Bulb
Replacement 4-196, 4-197
Stop Lamps
Malfunction 4-164
Strategy Based Diagnosis 6-83
Structure Identification 3-75
Strut Assembly
Removal and Installation 15-13
Sumitomo Connectors 11-928
Sun Load Sensor Replacement 10-144
Sunshade
Replacement 2-60
Supplemental Inflatable Restraint System Description and Operation 12-182
Suspension
Bottoms 15-30
Suspension Shock/Strut Disposal 15-15
Symptom Byte List 6-117
Symptoms
ABS 5-70
Active Grille Air Shutter 3-51
Automatic Transmission 16-25
Bolted Exterior Body Panels and Closures 3-9
Cellular Communication 8-28
Cruise Control 9-43
Data Communications 11-218
Display and Gauges 8-84
Engine Electrical 9-14
Entertainment System 8-28
Fixed and Moveable Windows 4-10
Horns 4-58
HVAC Systems - Automatic 10-129
Hybrid Controls 9-167
Hydraulic Brakes 5-136
Immobilizer 12-24
Lighting 4-141
Mirrors 4-204
Object Detection 12-41
Park Brake 5-244
Power Outlets 11-246
Power Steering System 14-9
Remote Functions 12-66
Seat Belts 12-86
Seat Heating and Cooling 13-29

Symptoms (cont'd)
Secondary and Configurable Customer Controls 8-109
Shift Lock Control 16-102
SIR 12-147
Squeaks and Rattles 1-34
Steering Wheel and Column Tilt 14-24
Suspension General Diagnosis 15-28
Theft Deterrent 12-187
Tire Pressure Monitoring 15-41
Vehicle Access 4-237
Vehicle DTC Information 6-122
Vibration Diagnosis and Correction 1-50
Wheel Drive Shaft 7-3
Wipers/Washer Systems 4-304
System Components
Programming Immobilizer System 12-27

T

Tail and Turn Signal Lamp Bulb Replacement 4-193, 4-194
Tail Lamp
Pocket Replacement 3-114
Replacement 4-192
Telematics Communication Interface Control Module
Programming and Setup 6-18
Scan Tool Information 6-81
Temperature Versus Resistance 9-198, 16-3
Terminal Position Assurance Locks 11-898
Terminal Removal 11-951
Testing for a Short to Voltage 11-877
Testing for Continuity 11-876
Testing for Electrical Intermittents 11-880
Testing for Intermittent Conditions and Poor Connections 11-877
Testing for Short to Ground 11-877
Testing Ground and Low Reference Circuits 11-876
Theft Deterrent
Control Module Replacement 12-26
Theft Systems
Description and Operation 12-189
Thread Inserts 1-19
Thrust Angles Description 15-65
Tie Rod
End Replacement - Outer - On Vehicle 14-14
Tire
Diagnosis - Irregular or Premature Wear 15-49
Diagnosis - Waddle Complaint 15-49
Inflation Description 15-61
Lead/Pull Correction - Radial 15-50
Mounting and Dismounting 15-56
Repair 15-52
Tire and Wheel
Assembly Balancing - Off-Vehicle 1-59
Assembly Balancing - On-Vehicle 1-63
Assembly Isolation Test 1-58
Assembly Runout Measurement - Off-Vehicle 1-54
Tire and Wheel (cont'd)
Assembly Runout Measurement - On-Vehicle 1-53
Assembly-to-Hub/Axle Flange Match-Mounting 1-64
Balancing 15-56
Inspection 1-52
Runout Specifications 1-36
Tire Pressure Indicator
Sensor Learn 15-44
Tire Pressure Monitor
Description and Operation 15-46
Tire-to-Wheel Match-Mounting (Vectoring) 1-63
Tires and Wheels
General Description 15-60
Removal and Installation 15-51
Toe Adjustment
Front 15-64
Toe Description 15-66
Torque Steer
Description 15-66
Diagnosis 15-30
Tracing Powder or Chalk Test 1-30
Traction Control/Stability Control Indicator
Malfunction 5-71
Training 1-10
Transmission
Component and System Description 16-93
General Description 16-92
General Specifications 16-5
Identification Information 16-92
Indicators and Messages 16-93
Internal Mode Switch Logic 16-5
Overheats 16-105
Replacement 16-45, 16-54
Transmission Case
Cleaning and Inspection 16-73
Transmission Control
Lever Malfunction 16-102
Replacement 16-34
Wiring Harness 16-70
Wiring Harness Installation 16-81
Transmission Cooler
Bypass Valve Replacement 16-113
Transmission Fluid
Drain and Fill 16-42
Level and Condition Check 16-28
Transmission Fluid Auxiliary Cooler
Replacement 16-112
Transmission Fluid Cooler
Bypass Valve Installation 16-91
Bypass Valve Removal 16-60
Flushing and Flow Test 16-106
Hose/Pipe Quick-Connect Fitting Disconnection and Connection 16-115
Inlet Pipe Replacement 16-119
Outlet Pipe Replacement 16-120
Pipe Connector Replacement - Radiator 16-114

Transmission Fluid Filter
Replacement 16-43
Transmission Fluid Pan
Replacement 16-40
Transmission Fluid Pan and Fluid Pump
Installation 16-89
Removal 16-62
Transmission Fluid Pump
Replacement 16-39
Transmission Mount
Replacement - Left Side 16-52
Replacement - Right Side 16-53
Strut Replacement - Rear 16-52
Transmission Rear Mount
Bracket Replacement 16-50
Trim Height
Inspection Procedure 15-35
Specifications 15-28
Trim Panel Replacement
Rear Quarter Lower 2-65
Troubleshooting with a Digital Multimeter 11-873
Troubleshooting with a Test Lamp 11-874
Troubleshooting With an Insulation
Multimeter 9-438
Trunk/Liftgate
Lock Malfunction 4-249
Turn Signal
Switch Replacement 14-31
Turn Signal Lamps and/or Indicators
Malfunction 4-167
Tyco/AMP Connectors 11-930, 11-932, 11-934, 11-935, 11-937, 11-943, 11-945

U

Ultra High Strength Dual Phase Steel 3-116
Ultra High Strength Steel 3-116
Unable to Contact OnStar Call Center 8-51
Underbody Front Air Deflector
Replacement 3-126
Replacement - Left Side 3-127
Replacement - Right Side 3-128
Underbody Rear Air Rear Deflector
Replacement 3-129, 3-130
Underbody Rear Side Rail
Replacement 3-111
Urethane Adhesive
Description 4-54
Using Connector Test Adapters 11-872
Using Fused Jumper Wires 11-874

V

Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label 1-12
Vehicle Leads/Pulls 15-29
Vehicle ON/OFF Switch Indicator Malfunction - DTC B097C 11-865
Vehicle Stability Control System Switch
Replacement 5-90
Vehicle Will Not Change Power Mode 11-867
Vehicle Yaw Sensor Learn 5-90
Vehicle Zoning Strategy 11-312
Vehicle-to-Vehicle Diagnostic Comparison 1-51
Vehicle, Engine and Transmission ID and VIN Location, Derivative and Usage 1-11
Vibrate Software
Description and Operation 1-81
Vibration 16-32
Vibration Analysis
Hub and/or Axle Input 1-46
Road Testing 1-37, 1-39
Tire and Wheel 1-43
Vibration Diagnosis, Starting Point, and Correction 1-36
Vibration Diagnostic Aids 1-48
Vibration Duplicated, Appears to be Potential Operating Characteristic 1-50
Vibration Duplicated, Component Not Identified 1-49
Vibration Duplicated, Difficult to Isolate/ Balance Component 1-50
Vibration Intermittent or Not Duplicated 1-48
Vibration Theory and Terminology 1-65

W

Wander Description 15-66
Washer
Malfunction 4-301, 4-309
Pump Replacement - Rear 4-326
Pump Replacement - Windshield 4-325
Water Hose Test 1-84
Waterleak
Test Preparation 1-83
Wheel Alignment
Measuring 15-63
Specifications 15-63
Wheel Bearing
Diagnosis 15-34
Hub Replacement - Rear 15-19
Wheel Drive Shaft
Description and Operation 7-16
Inner Joint Inspection 7-16
Wheel Speed Sensor
Replacement - Front 5-84
Replacement - Rear 5-86
Wheel Stud
Replacement 15-12, 15-26
Wheels
Replacement Wheels Description 15-61
Wheels/Vehicle Underbody Component Views 11-406
Window Regulator
Replacement - Rear Door 4-44
Windshield
Garnish Molding Replacement 2-61
Glass Cleaning 4-334
Replacement 4-25

Windshield Defroster
Nozzle Grille Replacement 10-68
Outlet Duct Replacement 10-67
Windshield Upper Reveal Molding
Replacement 4-30
Windshield Washer
Solvent Container Filler Tube
Replacement 4-323
Solvent Container Replacement 4-324
Windshield Washer Nozzle
Hose Replacement 4-320
Replacement 4-321
Windshield Wiper
and Washer Switch Replacement 4-319
Arm Adjustment 4-335
Arm Replacement 4-328
Blade Replacement 4-330
Windshield Wiper (cont'd)
System Malfunction 4-304
System Module Replacement 4-334
Windshield Wiper Motor
Replacement 4-332
Wiper/Washer
System Description and Operation 4-336
Wipers
Arm Replacement - Rear 4-329
Blade Element Cleaning 4-334
Chatter Repair 4-335
Wiring Repairs 11-883

Y

Yazaki Connectors 11-947

BLANK



Helm, Inc.
1448

GMP15SEV3